The Case for Synchronic Orthographic Primacy: the effect of literacy on phonological processing.

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I hereby declare that this thesis is of my own composition, and that the work reported herein is my own. Where I have received help, or made use of the work of others, reference is made to this fact at the appropriate place in the text, or in the acknowledgements.

Abstract

Orthographic interference on the phonological system has been documented by linguists for over a century, usually in the form of Spelling Pronunciation. This repeated observation of orthographic influence has not, however, resulted in orthography being admitted into the avenues of general linguistic study; rather it has become a controversial and problematic issue due to the apparent implausibility that the "man-made" writing system could possibly affect the "natural" phonological system. However, the very occurrence of such interference requires that the mechanisms involved are adequately accounted for, which previous studies in the area have not achieved. The purpose of this thesis is to establish the motivations behind the observed interference through examination of literacy attainment and its influence on the development of a speaker's phonological system from early literacy to full literacy.

Chapter 1 sets the background for the study, with an examination of various studies, from Saussure to the present day, which observe orthographic influence in the phonological system. Here the main issues of the topic which are discussed in the following chapters are introduced. This chapter also highlights the general linguistic attitudes to the controversial issue of orthographic influence on the phonology.

Chapter 2 explores the pre-literate phonological system and its development towards adulthood. Following this, an examination of reading strategies and abilities in children from pre-literacy to full literacy is undertaken. This allows direct comparison of how the process of learning to read relates to phonological development. On the basis of this comparison (and the status of an illiterate adult's phonological system) the conclusion drawn is that alphabetical literacy is the most likely source of phonological development to the segmental level.

Chapter 3 establishes whether or not the orthography has any role, beyond reading and writing, *after* the speaker is fully literate. Through examination of a number of studies, the likelihood of an ongoing link between the modes is ascertained. The discussion analyses the possible ways in which the orthography and phonology can be related in order to ascertain, through a process of elimination, how they must be related. Problematic issues concerning the interrelationship of the modes are also addressed in this section. The chapter concludes that the orthography is the primary mechanism, with the phonology generated from it through transparent rules.

Chapter 4 is an investigation of orthographic influence on linguistic theory. Chomsky & Halle's *The Sound Pattern of English* (1991) is examined to show how orthographic norms have been incorporated into Generative Phonology with the result that many of their underlyers are similar in form and function to conventional orthography. This section also examines the Vowel Shift Rule proposed in SPE, and suggests a simpler orthographic solution. The chapter concludes with exemplification of morpheme marking and blocking effects within a theory of orthographic primacy, closing with a re-definition of Spelling Pronunciation which more accurately accounts for its frequency of occurrence and its current status in the synchronic phonology of English.

Contents

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"We did not look too far ahead, lest the scale of the whole should dwarf and frighten us so much that we would hesitate to make the first step."

from *Savage Arena* by Joe Tasker

Introduction

This thesis is an examination of the effects of literacy on the speaker of English. Linguistic study has long debated the right of orthography to have any linguistic value, tending to marginalise the effects which have been observed, treating them as negative intrusions into the more pure phonology. This thesis endeavours to clarify what may be occurring with the observed orthographic influence and to give a credible account for why orthography must be considered to have a more central role than has been previously assumed for a literate speaker utilising an alphabetic writing system.

For the scholar studying the effect of orthography on language, Spelling Pronunciation (henceforth SP) is the most regularly noted effect of orthography - and the least explained. It is simply defined (for now) as a pronunciation using the most basic spelling-to-sound correspondences available when an orthographic form is encountered; for example, the name *Sean* is usually pronounced [si(:)n] by those who do not know the 'correct' pronunciation. It is also generally accepted that the occurrence of SP is greater in a second language than in a speaker's native language. In the case of second language SP the phenomenon is easily accounted for since we tend to use books to learn a second language where we generally acquire our first language before we can read. It is logical, therefore, that the second language user is likely to encounter a word in written form for which they have no pronunciation guide, the tendency in this situation is to use the most basic correlation between spelling and sound. The utterance made, if it does not correspond to the true pronunciation, is regarded as an SP, like *Sean* above.

There are however instances of SP in a speaker's native language that are not as simple to account for. Orthographic information can be used in two ways, either conscious or unconscious (automatic). In the second paragraph of Bloomfield's introduction 'the study of language' (1933: 3) he states:

> There are some circumstances, however, in which the conventionally educated person discusses linguistic matters. Occasionally he debates questions of 'correctness' - whether it is 'better,' for instance, to say *it's I* or *it's me*. His discussion of such things follows a fairly rigid pattern. If possible, he looks to the conventions of writing for an answer - as, say, for the question of whether a *t* is pronounced in words like *often* or *soften*. Otherwise he appeals to authority: one way of speaking, he believes, is inherently right, the other inherently wrong, and certain learned men, especially the authors of grammars and dictionaries, can tell us which is which.

This quote provides us with an account of the orthography's external role as a visual form which, as stated here, may be appealed to in issues of 'correctness'. However, the written mode referred to consciously for reference purposes does not account for any interference that the orthography has on the speaker's language mechanism, i.e. orthography is still external to the speaker so why should SP occur? What this shows that it is not the written word on the page that is of greatest interest, but rather the internalised orthographic system the literate speaker has assimilated when they become literate.

Conscious use of orthography can be generally defined as reading and writing (and looking to writing for clarification on pronunciation matters), where unconscious use encompasses uses where the speaker is unaware of the referencing, such as orthographic reference in affixation tasks. An example of this appeal to orthographic information has been suggested in Giegerich (1992a) where it is considered that spelling is the source of the literate speaker's tendency to produce the lax vowel [a] in the second syllable when asked to produce an adjectival form of the word *petal* using *-ic*, i.e. *petallic*. In other words, the linguistically relevant aspect of writing and literacy) is the internalised orthography used subconsciously by a speaker and the effect it has on the language ability, not the fact that a speaker can appeal to written forms for clarification in certain linguistic matters.

Such views are considered by many in the linguistic community to be quite controversial, with scholars generally preferring to keep phonology and orthography

distinct. Turning to Saussure, though, we can observe what it is about alphabetical writing which allows it attain its unique position in the linguistic mechanism.

> There are only two systems of writing:
> 1. The system often called 'phonetic', intended to represent the sequence of sounds as they occur in the word. Some phonetic writing systems are syllabic. Others are alphabetic, that is to say based upon irreducible elements of speech.
> 2. The ideographic system, in which a word is represented by some uniquely distinctive sign which has nothing to do with the sounds involved. This sign represents the entire word as a whole, and hence represents indirectly the idea expressed. The classic example of this system is Chinese. Saussure (1983: 26)

Here we see a fundamental distinction between the two types of writing system: the first writing system has linguistic value regarding the sounds (phonetic), each graph (or set of graphs) has a possible correlation with a phonetic value; where the other system involves visual symbols which have no relation to the phonetic shape of the word, but are instead nothing more than arbitrary visual signs which 'represent' words (ideographic), i.e. no phonetic information is carried in the visual mode. As such, the ideographic system allows no path to divine the pronunciation of a word from its ideograph if the pronunciation is not known. The reverse is also true: no attempt can be made to 'spell' the word if the phonetic element is known and the ideograph is not.[1] As a result of this there can be no interference between speech and writing as the two kinds of information can not be seen as two different representations of the same thing. There can also be no SP.

The phonetic system on the other hand employs graphs that correspond to phonetic values. This allows a literate speaker to pronounce written words they encounter for the first time - although it will not necessarily be the 'correct' pronunciation if the word's true pronunciation does not follow basic spelling-to-sound conversion norms. Also a fair attempt can be made by a literate speaker to

[1] This position is somewhat simplistic as Chinese does employ a system of phonetic radicals which give a clue to the pronunciation. In real terms though the statement is correct.

spell a new word - but again it will only be correct if the correct spelling adheres to the sound-to-spelling correspondences in the most basic manner. In such a system the possibility for feedback into the speech system is obvious because the internalised orthography is after all just a different kind of linguistic information (visual as opposed to phonetic) pertaining to the same linguistic unit (an archetypal underlying form which corresponds to both the sound and the spelling) and as such should be available to the literate speaker for pronunciation (cf. Chapter 3 for more on this area). This allows competition between the two forms when there is a discrepancy between the pronunciation and the spelling. In very basic terms the following situation exists for the literate speaker utilising an alphabetic writing system:

Phonological form: /ʃɔn/

Orthographic form: <Sean> ——————— Spelling Pronunciation: /sin/

The SP and the 'true' phonological form can compete for the pronunciation, with the SP being blocked by the phonological form to give the true pronunciation - note without the blocking, the default SP will occur. If we now consider a made-up ideographic system for the same word, exchanging the arbitrary symbol <⩓> for what would usually be <Sean> the relationship is:

Phonological form: /ʃɔn/

Ideographic form: <⩓> ——/——— Spelling Pronunciation: None[2]

As there is no phonological possibility for an SP from <⩓> the phonological form is unchallenged. There can be no SP (as we would conventionally define it) in a language employing an ideographic writing system.

[2] It is worth observing that the spelling of *Sean* is almost completely redundant as a means of representing the true pronunciation. Unless the speaker has the correct pronunciation to block the SP they will undoubtedly produce an SP. Note the regularised spelling *Shaun* addresses this issue by changing the spelling to fall into line with the required pronunciation.

Bloomfield states throughout his book that writing is not really language, which, despite being quite a dated view, is still a generally accepted position with regard to orthography, phonology and the interaction of the two. This thesis endeavours to clarify the situation regarding the observed orthographic interference, and will endeavour to reveal the possible motivation for spelling pronunciation as well as try to establish why orthographic information must become a central part of the linguistic mechanism for the literate speaker utilising an alphabetical system in a non-phonological way (see chapter 3).

The thesis is split into four chapters. The first is an examination of a number of studies which have examined the issue from Saussure to the present day. The list of authors in this section is by no means comprehensive, as many papers which could have appeared here are discussed in other chapters where the findings of the studies reinforce or overturn the argument of this thesis, and so are more appropriately cited there. The scholars who do appear in the first chapter though help to define the problem which phonologists have been faced with for over 100 years, and the way in which the established linguistic norms fail to admit the external influence of orthography with any ease. The section also clarifies a number of misconceptions and misquotes. Most notable are the views of Saussure, which will surprise many readers considering the way he is usually quoted regarding this issue.

The second chapter is a look at pre-literacy and the process of learning to read. This chapter endeavours to establish how a pre-literate (or illiterate) phonological system is constructed and what levels of phonological information they have access to, i.e. onsets, rhymes, phonemes. The development of the phonology is then examined, during the period when children are taught to read, in order to observe any changes which occur in the system. The second section of this chapter examines the proto-reading methods utilised by children while trying to learn to read, along with a comparison of these stages and the simultaneous development of more

detailed phonological awareness. The purpose of this section is to observe any link there is between a speaker becoming literate and segmental phonological development.

The third chapter examines the status of orthography for the fully literate speaker. The speaker obviously has to be able to interface the phonology and the orthography, a problem which this chapter examines in depth. The section begins with discussion of a number of papers which suggest a strong active involvement of the orthography in the phonological process for the literate individual, including exemplification of a number of productive phonological processes which cannot be accounted for without orthographic reference. The second part of the section endeavours to account for this productivity, as well as examining possible relationship configurations for the orthography and phonology. Through comparison and exemplification the various possible relationships are eliminated, to establish the configuration which most accurately reflects what the literate speaker can and cannot do, in terms of reading, speaking, spelling and comprehending speech.

The final chapter is an examination of orthographic effects on linguistic theory, specifically the roots of Generative Grammar:[3] Chomsky and Halle's *The Sound Pattern of English* (1991) - henceforth SPE. SPE frequently observes similarity between its underlyers and conventional orthography. The final chapter therefore examines the SPE account to see where this similarity comes from. In the pursuit of this issue it becomes apparent that SPE utilises a number of spelling-to-pronunciation rules to obtain their required phonological effects, with the similarity they observe deriving from this fact. The next discussion of the section examines the

[3] There may be some feeling that the discussion of SPE in the final chapter of this thesis is irrelevant in this age of OT, however the discussion is not an attack on the obviously outdated Generative Theory as much as a detailed observation that SPE seems fundamentally to have been drawn from spelling rules and norms. That this possibility could have slipped through the general observation is what is relevant. Also that further theories (such as Lexical Phonology) built on SPE, which will be shown in chapter 4 to be based on orthographic principles, shows that orthography was a central yet unacknowledged aspect of linguistic study for over 25 years.

Vowel Shift Rule, the core part of SPE, with a view to producing a simpler, orthographically driven solution to the alternations, based on spelling-to-sound correlations and morphological processes. This chapter concludes with some exemplification of orthographic devices which function as blocking mechanisms to ensure correct pronunciation. The chapter concludes with a redefinition of Spelling Pronunciation.

It is worthy of note that there are obviously various levels of literacy within the literate populace, from the barely literate to the hyper-literate. How any specific individual speaker utilises the orthography can never with any degree of accuracy be absolutely gauged. As a result of this, the literate speaker referred to in the second half of the thesis must be considered to be some kind of ideal literate - although there is a great likelihood that most literate speakers have some system akin to that outlined in chapter 3.

Overall this thesis tries to ascertain what linguistic information normal literate speakers are dealing with and how they might find solutions to their linguistic problems. I have endeavoured to adhere to the most logical, simple and obvious through examination of the facts and taking into consideration that not every speaker has a formal schooling in linguistics, so is unlikely to come up with some of the solutions that linguists do. There are many solutions to problems, and if any solution to an issue works, then it is just as likely to be correct as any other. We have no way to categorically corroborate either the linguist's complex solutions, or the simple solutions which seem to account for the same things in a simpler manner.

Why Optimality Theory is not being used.

Optimality Theory (OT) is currently the most dominant linguistic theory, so it may seem odd that I have not chosen to examine the concepts of this thesis in OT. This decision requires a brief explanation.

My main unease with the OT framework concerns the overall arbitrariness of the theory itself. OT works by selecting the 'optimal' candidate from an input of 'likely' candidates created by GEN, the generator, by means of a number of ordered, violable constraints. These candidates are then eliminated as outputs through constraint interaction in EVAL, the evaluator. OT does have its advantages in that it is extremely versatile and that it defines a clear and limited role for the constraints, which are both universal, and ranked according to EVAL (cf. Archangeli, 1997:27). And since the main focus is on the universality of constraints, with the ranking of constraints expressing distinctions between languages, there is no need for rules since the constraints are assumed to be both universal and innate, which means only the (language-specific) ranking of constraints needs to be learned. While this is theoretically advantageous, there are problems.

The claim that constraints express universal tendencies in languages (Prince and Smolensky, 1993:5) imposes an immense responsibility on linguists working within OT, in that one needs to be very careful when positing a new constraint during an analysis, otherwise the basic principle of the theory is endangered. And this is where the fundamental problem lies: OT has not been practised for that long (having emerged from Prince and Smolensky (1993)), yet the number of constraints that have been proposed in the literature is already enormous and surely cannot be considered to have the required universal validity. Archangeli (1997:15, fn 3) states:

> The ideal which Optimality research aims for (and sometimes appears to fall short of) is to provide evidence of the universality of each constraint necessary for some particular language. For constraints such as the ones

> posited for syllabification in this chapter, universality is readily motivated; there are numerous analyses involving constraints whose status as a universal is minimal at best. At this point, it is unclear whether this is a weakness of the model itself, or a weakness of the analyses.

Other problems stem from what should be included as generated inputs from GEN and more importantly why certain inputs are generated. There has been the suggestion, based on this thesis, that perhaps orthographic underlyers would provide a beneficial explanation of a possible source of inputs for GEN. Kager (1999: 19) states that the Lexicon contains lexical representations that form input to the Generator. It is possible the orthographic underlyers posited in this thesis could provide a tangible source for input forms to GEN. However, despite the fact that we can assume that orthographically driven forms are legitimately motivated due to the actuality of spelled forms in the real world and the strong influence literacy has on the phonology, the inclusion of GEN forms generated from the orthography does not appear any less arbitrary than any other form generated within OT. The orthography is no more valid than any other mechanism for the lexicon and would merely be introduced to try to give some tangibility to the severe problem of GEN within OT. Doubtless a more cutting-edge Optimality Theorist will be able to shoehorn the orthography into the generator in an acceptable way, but it appears to me that arbitrariness seems inescapable by the very nature of OT.

Chapter 1.

1.0 The Background.

This section gives a chronological account of the status of orthography in linguistic theory, or perhaps more accurately, its interference in linguistic theory, as perceived by the most prominent linguists who have examined the topic: from Saussure to present-day scholars. The purpose of this is to note what the general opinions are in the community of linguists on the issue and what conclusions have been drawn. This section is not an examination of the workings of any orthographically driven processes that are mentioned, e.g. Spelling Pronunciation. Aspects of these processes and how they work will be dealt with in later sections. This section will endeavour to establish that, as far as this thesis topic goes, although there is not a large amount written on the subject, those who did write had much more to say than they were ever quoted as saying - with their opinion-driven conclusions being all that people cite. In many cases, the scholar's journey through the topic is more valuable than the ultimate conclusion as it reveals an understanding from the author far in excess of that stated in the conclusion.

1.1 Saussure and Bloomfield.

Two scholars have probably had the greatest influence on later 20th Century scholarly opinion on the issue of orthographic influence, and they are Saussure and Bloomfield. Both are regularly cited as holding views which limit the scope of linguistic study to the spoken form only, limiting the written form to a visual representational system only. Unfortunately, it appears that most people who cite these scholars have not read the original texts, because when they are examined, it becomes apparent that there is much more to both scholars' opinions than the sterile quotations which are cited, quotations which make them appear ignorant of facts that in reality they discussed and wrestled with at length. A good example of this occurs

in Giegerich (1992a: 415) where Saussure's is quoted as saying '...spoken forms alone constitute the object [of linguistic study]', where an examination of Saussure's discussion would have been beneficial as Giegerich's paper is an examination of the more prominent role of spelling in phonological processes.

1.1.1 Saussure (1906-15).

Papers on the status of orthography usually begin with a historically based discussion of the topic. The battle lines are drawn and the discussion establishes which scholars support each of the viewpoints through a series of quotations and article citations, dividing the linguistic community into those who think orthography is linguistically relevant and those who don't. In such discussions Saussure is usually the first person to be quoted. The problem with what is usually quoted is not everything that Saussure has to say about the effect of writing on language. It soon becomes evident that it is merely his opinion advanced in the face of overwhelming linguistic facts.

Since the mid 1960s onwards linguistic study has examined various recurring themes involving orthography and its effect on a person's language, i.e. SP, orthographic reference in phonological processes, and many other 'orthographic effects'. What is of great interest is that Saussure was discussing many of these points at the turn of last century, way ahead of his time. Much of his discussion is both interesting and worthy of examination, and some of it reflects an almost prophetic intuition about the position of the orthography as primary linguistic information for a speaker. The point of perhaps the greatest interest is that the phenomena which occur today with orthography were also occurring at the beginning of this century.

As was noted in the Introduction, SP occurs both in second languages and native languages. Saussure states:

> Even in the case of our native language, the written form constantly intrudes. Saussure (1906-15: 24)

This statement could come from any present-day paper dealing with SP. The only difference is that Saussure, in defiance of the facts he is observing, will not accept that orthography has any linguistic value. How he manages to do this is elusive though, as is shown in his further statement:

> Thus although writing itself is not part of the internal system of language, it is impossible to ignore this way in which the language is constantly represented. We must be aware of its utility, its defects and its dangers.
> Saussure (1906-15: 24)

The effect of writing on the phonology is inescapable, but he treats it as a dangerous abomination, where now we are trying to account for it and its influence.

Obviously Saussure is noting that writing has an effect on the spoken language and as such he has to give a definition of the relationship between speech and writing:

> A language and its written form constitute two separate systems of signs. The sole reason for the existence of that latter is to represent the former. The object of study is not a combination of the written word and the spoken word. The spoken word alone constitutes that object. But the written word is so intimately connected with the spoken word it represents that it manages to usurp the principal role. As much or even more importance is given [presumably by the general literate populace - SM] to the representation of the visual sign as to the vocal sign itself. It is rather as if people believed that in order to find out what a person looks like it is better to study his photograph than his face. Saussure (1906-15: 24)

Again we see the conflict Saussure has between the facts he is confronted with and his opinions on how things should be. But even although he is claiming that the two systems are separate, the examples he cites show this is far from the case in reality; and it is also evident that he is aware that, if anything, the situation will become more common. For example, on the subject of synchronic SP undoing diachronic phonological change he writes:

> Probably such misunderstandings will become more and more frequent. More and more dead letters will be resuscitated in pronunciation. In Paris, one already hears *sept femmes* ('seven women') with the *t* pronounced. Darmesteter foresees the day when even the two final letters of *vingt* ('twenty') will be pronounced: a genuine orthographic monstrosity.
>
> These phonetic distortions do indeed belong to the language but they are not the result of its natural evolution. They are due to an external factor. Linguistics should keep them under observation in a special compartment: they are cases of abnormal development.
>
> Saussure (1906-15: 31)

Whether it is external or not though is irrelevant if it is having an effect on the phonology. We see that what Saussure is trying to say is not that writing is not affecting language (because it obviously is), but that it is external, man-made and as such should not influence what he considers real language. It is also true to say that SPs do indeed distort the natural evolution of real language. What is not noted is that the spelling driven pronunciation is synchronically predictable, in that the values assigned phonologically are those relevant at the time of the coining of the SP. Saussure even gives us the environment for SP occurrences (although not explicitly):

> In the first place a language is in a constant process of evolution, whereas writing tends to remain fixed. It follows that eventually spelling no longer corresponds to the sounds it should represent. A spelling which is appropriate at one time may be absurd a century later.
>
> Saussure (1906-15: 27)

The next line could almost read: 'This gives the environmental context for SP to occur'. But the environment itself is not justification enough for why a process will occur. There has to be a trigger of some description. Why does the process occur in the environments outlined? The environment is only half the answer and Saussure gives four reasons for occurrence of SP:

> But what explains the prestige of writing?
> 1. The written form of a word strikes us as a permanent, solid object and hence more fitting than its sound to act as a linguistic unit

> persisting through time. Although the connection between word and written form is superficial and establishes a purely artificial unit, it is none the less much easier to grasp than the natural and only authentic connection, which links word and sound.
> 2. For most people, visual impressions are clearer and more lasting than auditory impressions. So for preference people cling to the former. The written image in the end takes over from the sound.
> 3. A literary language enhances even more the unwarranted importance accorded to its writing. A literary language has its dictionaries and its grammars. It is taught at school from books and through books. It is a language which appears to be governed by a code, and this code is itself in written rule, itself conforming to strict norms - those of orthography. That is what confers on writing its primordial importance. In the end, the fact that we learn to speak before learning to write is forgotten, and the natural relation between the two is reversed.
> 4. Finally, when there is any discrepancy between a language and its spelling, the conflict is always difficult to resolve for anyone other than a linguist. Since the linguist's voice often goes unheeded, the written form almost inevitably emerges victorious, because any solution based on writing is an easier solution. In this way, writing assumes an authority to which it has no right. Saussure (1906-15: 26)

It becomes very apparent that it is only Saussure's own feelings on the role assumed by orthography that is quoted by subsequent scholars. His understanding of the facts of the issue is far greater; he merely does not approve of the facts. He writes in no uncertain terms that 'the written word ... tends to become a substitute in our mind for the spoken word' (Saussure (1906-15: 27)). His argument is not that the orthography has no value, but *in his opinion* the status of orthography should not be so elevated and that the word's etymology is all that is relevant:

> The pronunciation of a word is determined not by its spelling but by its history. Its spoken form at any given time represents one stage in a phonetic evolution from which it can not escape. This evolution is governed by strict laws. Each stage may be ascertained by referring back to the previous stage. The only factor to consider, although it is most frequently forgotten, is the etymological derivation of the word. Saussure (1906-15: 30)

This position would be true if there were no other factors. But as Saussure himself has noted extensively, there is orthographic influence that can have a 'jerking' effect

on literate phonology, based on synchronic spelling-to-pronunciation (S⇨P) norms, overturning the 'strict laws' governing the spoken forms - an effect Saussure was only too aware of.

Considering Saussure's distaste for orthographic interference we would expect that in conclusion he would give some remedy for the problem as he sees it. But instead of a solution he gives a projection of what may occur:

> ... the tyranny of writing extends further yet. Its influence on the linguistic community may be strong enough to affect and modify the language itself. That happens only in highly literate communities, where written documents are of considerable importance. In these cases, the written form may give rise to erroneous pronunciations. The phenomenon is strictly pathological. Saussure (1906-15: 31)

His dislike of the central role of orthography is evident through his vocabulary (*pathological* being defined in the OED as 'of or caused by a physical or mental disorder'). But his prediction is one which may in the course of time become more and more valid, assuming 'erroneous' to mean those pronunciations which have become SPs when from an etymological evolution perspective they would perhaps have been different.

So what did Saussure think about orthography? The answer to this is difficult to ascertain. Various areas are discussed which point to an acute awareness of how orthography functions for second language learners, along with examination of the phenomenon of SP in terms of the environment it affects, as well as what appears to have occurred within the literate speaker's perception of language and pronunciation. His predictions suggest a prominent and undeniable position for orthography as literacy becomes ever more entrenched in societies. All of these things point to an advanced awareness in Saussure regarding what has happened (and is happening) since literacy has become more commonplace, yet quotation of Saussure generally only expresses his opinion on the position of orthography, ignoring that Saussure's opinion only told how he would like it to be, rather than how he describes it to be.

1.1.2 Spelling Influence According to Bloomfield.

Bloomfield (1933) does not refer to Saussure on the matter of spelling influence in linguistic theory, although some of the conclusions he reaches could be drawn directly from Saussure. The regularly cited position held by Bloomfield is that:

> Writing is not language, but merely a way of recording language by means of visible marks. Bloomfield (1933: 21)

Unlike Saussure, Bloomfield does not give such a balanced argument concerning spelling influence, instead tending more towards the view which marginalises orthography. The intuitions expressed by Saussure that the written form has usurped the spoken form to become more primary in the linguistic system of the speaker also do not figure nearly as strongly in Bloomfield. Instead, the orthography is treated more like a reference system used for clarity in certain linguistic matters (see Introduction). Bloomfield is aware of the conscious use of orthographic information as previously defined and it is this he uses to give us his view that 'writing is not language'. The question which now becomes relevant is: does the internalised orthography hold any validity for Bloomfield?

The answer to this at first appears to be a categorical no. Bloomfield writes:

> All writing, in fact, is a relatively recent invention, and has remained, almost to our day, the property of only the chosen few: the effect of writing upon the forms and the development of speech is very slight. Bloomfield (1933: 13)

This environment created by Bloomfield minimises (but does not rule out completely) the possible effects orthography could have on 'language', firstly through noting that writing (as compared to speech) is a recent phenomenon (so how could it have had an effect in such a short time?); and secondly, literacy is not universal, so if literacy is a factor in the possible effects of orthography on speech,

then the lack of universal literacy will have a great bearing on the possibility for effects. The combination of the two would seem logically to limit the effects orthography could possibly have. However, even from this position Bloomfield concedes that there has been a 'slight effect' - although this is never explicitly explained. This leaves us with something of an enigma. We would expect it to be the case that for the written form to influence the spoken form we would need the affected population to show high levels of literacy. But this does not necessarily seem to be the case as even taking Bloomfield's views into consideration there is still the 'slight effect' he refers to (cf. Section 1.5 below).

The position Bloomfield creates and defends is one which fundamentally ignores the effects the written form has on language:

> In order to study writing we must know something about language, but the reverse is not true. (1933: 21)

This attitude, which is pervasive in Bloomfield, is one which constantly endeavours to keep orthography external to a person's language thus limiting any effect it may have on that language. The above shows that for Bloomfield, orthography can be marginalised to the point of being unnecessary for the study of language. This has been shown to be an erroneous viewpoint in Giegerich (1992a) which expounds the necessity for orthographic reference for pronunciation of affixed forms of the type *atom ~ atomic* (cf. section 3.3.3). Studies of this nature have shown that Bloomfield's later statement is also true only to a point:

> writing...turns out, upon inspection, to be merely derivative of language. Bloomfield (1933: 144)

There is no note of any possible influence in the other direction. Obviously this statement is true as a historical account of where writing came from, yet the possibility, even probability, that writing will have effects once assimilated into a language is not a position Bloomfield is keen to discuss. For Bloomfield writing is

'merely' a one-way system from speech to writing. There is no intuition that the internalised orthography may cause feedback into the speech system. This idea of the orthography feeding into the speech mechanism will be further explored in chapter 3.

But Bloomfield *is* aware of the general superiority of the visual mode over the spoken form in dealing with complex matters as is seen in his statement on the evolution of writing:

> We can see more things at one time than we can hear, and we can deal better with visible things: charts, diagrams, written calculations, and similar devices, enable us to deal with very complex matters.
>
> Bloomfield (1933: 40)

It does not seem too big a leap from this position to one where visual information could be used in actual speech processing for the literate adult at an unconscious level, for the simple reason that the addition of the visual mode, which the literate has to internalise and store, gives a more physically concrete aspect to their language that they previously did not have. But this does not occur to Bloomfield, even although he outlines the facts which show that it is plausible that the more permanent physical tangibility of the written form over the transient spoken form could be utilised at an unconscious level to help deal with the 'complex matter' of language. Bloomfield consistently tries to maintain that writing is always an external source of information, even considering the difficult contradictory information:

> For the linguist, writing is, except for certain matters of detail, merely an external device, like the use of the phonograph, which happens to preserve for observation some features of the speech of past times.
>
> Bloomfield (1933: 282)

What are his 'certain matters of detail'? He does not say, but this is only the first of two statements which hint at something which Bloomfield never explains. The second occurs in his discussion of picture writing:

> Records and messages of this sort are usually spoken of as 'picture writing', but this term is misleading. The records and messages, like

> writing, have the advantage of being permanent and transportable, but they fall short of writing in accuracy, since they bear no fixed relation to linguistic forms and accordingly do not share in the delicate adjustment of the latter. Bloomfield (1933: 283)

With regard to what Bloomfield means, this statement is more confusing and also more open to question than the first. Firstly, what is the linguistic form that is referred to? It seems to be the phonetic aspect of the word. But can he be saying the writing 'adjusts' the speech? If so in what way? There is also an echo of the argument posited earlier regarding the lack of SPs in ideographic systems. But again this would mean Bloomfield is contradicting his earlier statement on the arbitrariness of the writing system employed by a language. In short he does not explain what he means with regard to these adjustments and details, they just appear and are passed by leaving the reader who is looking for just this sort of thing bemused.

Bloomfield's argument stands as one which is contradictory but which overall endeavours to limit the status of writing to an external source only. There are effects, as Bloomfield discusses, but the effects are 'slight' and are never really examined. In the final pages his opinion over fact become more evident:

> In the long run, to be sure, the orthography does cause some linguistic alternations; aesthetically - and this is here the only consideration - we should gain by eliminating the factor of ugly spelling-pronunciations. Bloomfield (1933: 501)

Bloomfield, up to this point, is - disregarding his contradictory statements - describing and accounting for the written mode as it was perceived in his period. The mistakes he makes can perhaps be overlooked as limitations of the information available at the time. But now there is also the possibility that his position was greatly inspired by his dislike 'aesthetically' of the effects writing was having, i.e. SPs. His solution to the problem:

> There would be no serious difficulty about devising a simple, effective orthography for all types of standard English; the use of it would save an enormous amount of time and labour, and, far from injuring the

> language, would raise the general level of standard speech, both by reassuring native speakers of non-standard and by removing the tendency to spelling-pronunciation. Bloomfield (1933: 502)

The solution here proposed is to remove 'ugly' SPs by making everything an SP.

So what is Bloomfield's position on the effects of writing on a person's language? The answer seems to be far clearer than that in Saussure. With Bloomfield it seems simply to be the case that he sees writing only in terms of its physical written form external to the speaker - even although he wrestles with fundamental issues which make this position untenable. The phonetic information attached to the graphemes is utilised for correct pronunciation (and in those who are not educated correctly this gives 'ugly spelling-pronunciation'). In general orthography is seen as having no value linguistically except as a partial document of how people spoke historically: 'We get a glimpse of the state of affairs in the spoken language from occasional and aberrant spellings or from rimes' (1933: 486). As for the 'delicate adjustments' one can only guess at what is meant. They are not condemned, yet are not explained. One thing does seem fairly certain from Bloomfield though: even considering his hard-line position he has had to give ground to spelling influence and seems to be aware of effects writing is having on speech, even if he is not telling us what they are.

1.1.3 Saussure & Bloomfield: Conclusion

As the above discussions show, the quotations usually associated with both Saussure and Bloomfield only tell half of their respective stories. With regard to the issue of orthography this is problematic as the conclusions which people cite only reflect opinion and not any tangible fact-based conclusions. The discussions within both papers reflect a situation with regard to the status and influence of orthography which

surely - with today's more enlightened scholarly approach - cannot be dismissed because we do not like what the facts suggest.

1.2.0 Householder (1971).

> 'It reminded me somewhat of the cliché rustic who believes that by shouting loud enough he can make the monolingual foreigner understand him.'[1]
>
> From the 'preface' to *Linguistic Speculations* (1971).

Fred Householder is one of the first scholars who could be said to be overtly pro-orthographic primacy. He even names his chapter on writing 'the primacy of writing' which leaves the reader in little doubt as to which way his argument is to be directed. Perhaps the unashamedness of his opinion and chapter name are safe from too much criticism for being controversial as the book is entitled *Linguistic Speculations*. His awareness that the subjects and theories discussed are not subscribed to by the general linguistic population is shown in his 'preface':

> Over the years I had formed a number of opinions about linguistic questions, questions which I considered (and consider) interesting and important, and opinions which are at least unpopular and perhaps novel.
>
> Householder (1971: vii)

'Unpopular' and 'novel'. The orthodox (linguistics) views are evident throughout the preface, but as Householder says:

> We should always be willing to search out and reconsider our fondest beliefs, our oldest traditions, the words of wisdom passed down from our gurus.
>
> Householder (1971: ix)

This is what he endeavours to do in the book, examining concepts which are not subscribed to in the field of linguistics (some of which still are not) to show that what is accepted as 'wisdom' from the 'gurus' is opinion which should be examined and

[1] Householder is seen as a 'maverick' linguist by many, promoting ideas which go against the grain of conventional linguistic theory. It is nice to see him putting into words the way he feels about furthering ideas which are not generally accepted in linguistic study.

questioned and not merely followed as if it were the 'truth'. It is interesting that the status of writing should be considered a controversial issue, but this perhaps just highlights the correctness of Householder's observations in the 'preface'. Saussure and Bloomfield (especially) have had a profound effect on linguists' views of the status of orthography and its relationship to speech. In my own research for this thesis I have found repeated reference to both Saussure and Bloomfield following only their negative views of written forms; views which tell only half of the story. Regardless of this, the backdrop to the writing of Householder's book and the possible way it may have been received, Householder's opinions and examinations follow reasoning based on common sense and logic to establish the relation between speech and writing in a very convincing way. It is worth noting that some of his ideas are difficult to accept, but it is the overall effect of what he says which has great relevance.

1.2.1 Tarzan the Ape Man.

Householder's examination of the issue of the linguistic status of writing begins with an examination of E. R. Burroughs *Tarzan of the Apes* (1963)[2], with special reference to the manner in which young Tarzan learns to read and then to speak. In brief the events of the novel are as follows: Tarzan learns to associate 'little bugs' (alphabetic letters) with pictures, i.e. <boy> is always associated with a picture of a young male human; the three units form a whole which is interpreted as 'boy', although there is no phonetic information carried in the reading, i.e. Tarzan is reading ideographically. Tarzan then encounters a man (D'Arnot) and asks him to teach him to speak the language of men, which D'Arnot does (eventually). The order of learning of reading and speaking is what interests Householder. As he points out this is the most logical way for the two modes to be taught for the simple reason that if we first learn to

[2] Any reference to the book is taken from Householder not from a copy of the novel.

speak and then to read, we 'must go back and correct all the errors we made by learning to speak first' (Householder (1971: 248)). What does he mean by this? Simply that the spoken form does not match the written form sound for sound and we have to learn the spelling forms in one and only one way (discounting small regular changes due to morphology), where with the spoken form we can have any or all of the connected speech possibilities. The reason Householder suggests we must go back and correct is because phonetic variants of a single morpheme would be stored in error as distinct words. When speakers learn to read they discover that in reality some phonological forms are variant representations of one morpheme which must be drawn together and associated with one spelled form for the morpheme, thus giving continuity over both speech and writing. This is a complicated issue, but it makes sense on the assumption that before a person learns to read, they have a fully functional phonology - a view which Householder would likely subscribe to (cf. Chapter 2). The obvious conclusion to avoid this complicated way of structuring the two modes is to learn to read and write first because this mode is more fully specified with regard to the morphology and the citation speech form. Consider the possibilities for the word *and* from a position where speech is learned before writing:

POSSIBLE PHONOLOGICAL FORMS			POSSIBLE SPELLINGS FROM THE PHONOLOGICAL FORMS
/and/		⇨	<and>
/nd/	(	⇨	*<nd>)
/n/	(	⇨	*<n>)

In this simplified example, there are three pronunciations which, when a person learns to read, must be associated with one spelled form. After learning to spell the word, the relationship is still arbitrary because the spelling of /and/, /nd/ and /n/ all become <and>. For the speaker there will be no logic in the lack of spellings *<nd> and *<n>, as the three phonological variants would possibly not have been stored as

a single entry prior to learning to read, so why don't they all have different spellings? This example is obviously fanciful (and somewhat half-baked), but it does highlight Householder's observation regarding the order of learning the language modes. For the person who learns to speak first, this situation with *and* is an error which has to be corrected. All three of the variant pronunciations must be assimilated into one phonological form which corresponds to a single orthographic form. The variant forms [n] and [nd] can then be achieved at this stage through standard connected speech processes. Householder's idea becomes clearer when we consider the same word with the assumption this time that the speaker has learned to read and write first:

SPELLED FORM		POSSIBLE PRONUNCIATIONS OCCURRING NATURALLY THROUGH CONNECTED SPEECH PROCESSES[3]
<and>	⇨	/and/
	⇨	/nd/
	⇨	/n/

The written form when converted to phonological form gives the slowest tempo variant /and/, and standard rules of speech tempo such as cluster simplification (see Lodge 1984) will allow the other variants to be formed and accounted for automatically and predictably. Also all of the phonological forms convey at least part of the information held in the spelling. As this simply shows we can move easily from writing to speech (in most cases) but we have missing information when the problem is addressed from the direction of speech to writing. This position is hardly groundbreaking, but it does form the basis of Householder's motivation for positing orthographic primacy.

Based on this concept, Householder takes the position that 'sophisticated students of language' want to attack this view because it is logical to have writing

[3] See Lodge (1984) on Connected Speech simplification processes.

first and speech as a way of 'performing written materials' (1971: 248). This is obviously a little overstated by Householder, but the principle is correct if stated in slightly different terms: why have scholars felt the need to discuss and reject the linguistic status of writing? The answer, because it makes such good sense but *it ought not to be the case*. Speech ought to be more primary as it is learned first (and naturally), whereas writing is taught at a later stage and has to be consciously learned. This concept alone seems to be enough of a motivation for scholars to keep orthography out of the grammar. Householder though is not satisfied with this position, with his argument an attack on the concept that 'writing and written materials are of no concern to the linguist' (1971: 250).

Householder follows the (rather weak, but interesting) basic premise that because it seems that writing is more primary than speech in the linguistic mechanism, study of the area must be undertaken to ascertain its likelihood. The first fundamental question he asks is: 'in literate communities, by and large, does orthography influence pronunciation or does phonology influence spelling?' The answer to this is that the dominant direction of influence is for pronunciations to become reflections of spellings and not for spellings to reflect pronunciations. Perhaps this is because people are aware of the obvious situation whereby spellings are fixed and speech is transient. However it cannot be ruled out that an alternative answer is that orthography is the primary language mode for the literate speaker with the phonology being a product of it. Householder looks at examples of both spelling influencing speech and speech influencing spelling.

Spelling reformers for example want <night> to become <nite>[4] and <through> to be <thru>, etc.. The effect of campaigning though has had little effect

[4] It is worth noting that both the standard spelling system and the 'reformed spelling' both use a vowel graph marker to predict vowel quality: <gh> in *night* and final <e> in *nite*. The regularised <nite> spelling works within the standard spelling system too, a system which the literate can easily work. Obviously final <e> as a marker for vowel quality is more common, but literates have no problems with the <gh> forms either. How is the made-up example <vight> pronounced? Only a unique graph for each sound can be considered phonetic, i.e. the IPA.

on the writing system. But in the direction of spelling influence on speech, Householder exemplifies the regular occurrence of SP, specifically the loss of historical pronunciations due to spelling influence:

ORTHOGRAPHY	'CORRECT' PRONUNCIATION	SPELLING PRONUNCIATION
palm, balm, etc.	/-a:m/	/alm/
forehead	/fɔrɪd/	/forhɛd/
diphth-eria, -ong	/-pθ-/	/-fθ-/
kiln	/kɪl/	/kɪln/
victuals	/vɪtlz/	/vɪktʃəlz/

This is obviously only a small proportion of the total number of SPs which have occurred (and are still occurring). There are also historical cases where SPs have competed with alternative pronunciations, with the SPs prevailing to become the standard today, e.g. <certain> was historically pronounced /sartɪn/, <author> had medial /t/ instead of medial /θ/, <gold> and <Rome> were once /gu:ld/ and /ru:m/, etc.[5] The influence of the orthography has, Householder (1971: 253) says, been 'continuous for so long that it is impossible to document any striking changes'. Through these examples though his point is self evident: spelling changes pronunciation more than pronunciation changes the spelling which shows the dominant and intrinsic nature of orthography within a person's language. In fact, only the most commonly used words fail to be affected by SP, i.e. *could* is never pronounced by a native speaker with the /l/ and *have* is never pronounced so it would rhyme with *cave*. No doubt the sheer frequency of use fixes the pronunciation of these words. Householder concludes the discussion on the issue of influence of one mode on another with the following statement: 'naïve speakers (of English) intuitively feel that speech is a rendition of writing, not vice versa' (1970: 253).

[5] See Kerek (1977) below (section 1.3), and Jones (1989) on these historical pronunciations.

There seems to be evidence that the written form has the ability to affect the spoken form, but rarely vice versa, which suggests orthographic dominance within the lexicon. So, is this more or less economical than assuming phonological dominance? There would be no merit to orthographic primacy if there was to be no benefit for the speaker from the perspective of economy, i.e. if the linguistic load on the speaker were to become increased as a result of the primacy shift this would not be beneficial to their overall language utility (and would therefore, following economy arguments, not occur). Various examples are given by Householder which exemplify the greater economy within a system which employs orthography in a primary role. The pronunciation /ʃ(ə)n/ has various spellings:

fashion, cushion	/faʃ(ə)n/, /kuʃ(ə)n/
beautician	/bjutɪʃ(ə)n/
suspicion	/səspɪʃ(ə)n/
ocean	/oʃ(ə)n/
coercion	/koɛrʃ(ə)n/
fiction	/fɪkʃ(ə)n/
mission	/mɪʃ(ə)n/
complexion	/kəmplɛkʃ(ə)n/

The most common representation of /ʃ(ə)n/ is <-tion> which occurs in around 2,500 words according to Householder (1970: 255). This can be regarded as the default rule for the production of spelling forms from this pronunciation. Filtering rules are required to account for the other forms so they do not follow the default rule. The following possible rules are posited by Householder (1971: 254-255) to account for the variant forms:

(1.1)	exception forms are listed, i.e. *Groschen, fashion, cushion, Titian, dietician, dititian, patrician, mortician, beautician, suspicion, ocean, coercion, Thracian, Grecian, Caducean, sponsion, fiction, tertian Lacertian, Nemertian.*
(1.2)	/ʃ(ə)n/ ⇨ <-ician> if there is a corresponding monosyllable ending in /ʃ/ = -sh, or list *ashen, freshen, harshen*, etc.
(1.3)	/ɪʃ(ə)n/ ⇨ -ician if there is a corresponding word in -ic or ics. (Alternatively, list about 40 words.)
(1.4)	/ɪʃ(ə)n/ ⇨ -ission if preceded by /s/, /f/, /m/.
(1.5)	/-lʃ(ə)n/ ⇨ -lsion.
(1.6)	/-anʃ(ə)n/ ⇨ -ansion.
(1.7)(a) (b)	/tenʃ(ə)n/ ⇨ -tention if preceded by *in* or *dis*, or if there is a corresponding word in /te:n/ = tain. ⇨ <tension> if preceded by zero or /haɪpo:/, /haɪp(ə)r/ (= hypo, hyper) or if there is a corresponding word in /tend/ = tend (note this again includes *in* and *dis* again).
(1.8) (a) (b)	/fɪkʃ(ə)n/ ⇨ -fixion except after # (<fiction>). /flokʃ(ə)n/ ⇨ fluxion optionally: /flɛkʃ(ə)n/ ⇨ flexion /nɛkʃ(ə)n/ ⇨ nexion /k(ə)mplɛkʃ(ə)n/ ⇨ complexion
(1.9) (a) (b) (c) (d)	/tɔ:rʃ(ə)n/ ⇨ torsion after #, /r/ (re-), /ɪn/ (in-). /orʃ(ə)n/ ⇨ -ersion after m, st /arʃ(ə)n/ ⇨ -artian /e:ʃ(ə)n/ ⇨ -acean.
(1.10)	/-ʃ(ə)n/ ⇨ -ssion if precede by a lax vowel (or by the features [- tense, -consonant] or some equivalent).
(1.11)	/ʃ(ə)n/ ⇨ -tion.

As noted above, rule (1.11) is the general rule with the others being ordered to filter out the non-default forms (although Householder says the order is unimportant as long as (1.11) is last). The rules have been reproduced here in full because the complexity of such a set of rules is important to the arguments in favour of positing a simpler set of rules which account for the same information from the direction of orthography to phonology. The visual effect of the above rules gives a shock value that highlights this complexity and the simplicity of the second set of rules Householder posits.

The second set of rules (Householder (1970: 255-256)) approach the problem from a position where the orthography, not the phonology, is the output of the lexicon. The information from this output forms the input for the phonological component of the grammar. The rules in this case generate all the possible ways to pronounce <-tion>.

(2.1)	-stion ⇨ /stʃ(ə)n/ or /ʃtʃ(ə)n/.
(2.2)	cation kation } ⇨ /katajən/
(2.3)	himation ⇨ /hɪ-matjən/ or /haɪ-me:ʃn/.
(2.4)	equation ⇨ /ɪ:-kwa:ʒn/, /əkwe:ʒn/.
(2.5)	-tion ⇨ /ʃ(ə)n/

Obviously this is a great deal simpler than rules (1.1 - 1.11) above, but it does not account for the other /ʃ(ə)n/ forms. Householder does give rules for the other forms though which are outlined below. These rules would be placed before rule (2.5):

(2.4.1) (a) -mersion
abstersion ⇨ /morʃ(ə)n/
/ab-storʃ(ə)n/

(b) - - -l
n sion ⇨ /l
n ʃ(ə)n/

(c) - - - xion - - - ⇨ /kʃ(ə)n/

(2.4.2) (a) -sh
-c
-ss
-t i an
on ⇨ /ʃ(ə)n/

-s(c)hen
-cean

(2.4.3) -si on
an - - - ⇨ /-ʒ(ə)n/

The simplicity of these rules is self evident. It is far easier to produce S⇨P rules than to produce pronunciation-to-spelling (P⇨S) rules. Also the rules for the former are not esoteric while those in (1.3) are complex rules even for a linguist. Can we really assume a speaker creates such complex rules to relate the spellings and sounds? In short, the pronunciation of a spelled form is easier to predict than the spelling of a pronounced form. Rule generation therefore makes more sense if moving from the orthography to the phonology as it is a simpler way to account for the same information. As Householder points out: if there are only these two possibilities then this is the best of the two. But he is also intrigued by alternate explanations and examines SPE[6] and the ideas posited there.

SPE proposes an underlying structure which is (in many cases) coincidental with the spelled forms[7], although the pronunciation follows a pattern which would have been more representative of classical Latin, according to Householder. Through

[6] Note: discussion here is restricted to Householder's comments on SPE. A fuller examination of SPE and the underlyer issue will be undertaken in Chapter 4.
[7] The orthographic similarity in SPE is examined in depth in Chapter 4.

a series of ordered rules the various segments are manipulated to give today's pronunciations. The relevant question Householder asks is why would we require an orthographic-style underlying structure *and* an orthography? The orthographic system is required anyway and if the phonology can be driven from this, is the deep structure really needed? Following the principle of Ockham's razor Householder suggests that the 'systematic phonemic' level is dispensed with completely in favour of the orthography. He suggests that the system would be given a feature system which uses the letters in a non-binary system, i.e. [letters]: [a letter], [b letter], etc. to [z letter]. Two sets of rules are suggested to make the system work: one set to manipulate the letters and a second set to map the letters onto sounds. Various example rules are given to highlight the economy of such a system (Householder 1970: 258-259). The following is suggested as a rule which 'applies more economically at the spelling level':[8]

ed ⇨ *d*	before juncture and after a morphological boundary except in *naked, dogged, beloved*, etc.

Although why this should be more economical than a phonological rule which deletes unstressed vowels in the same environment and with the same exceptions is unclear. The rewriting rule:

equation ⇨ *equasion*

is also posited to bring it into line with the general rules previously discussed. Again there seems little point in such an alteration when for the same economy deficit the following rule could be added:

<equation> ⇨ /ɪkweʒ(ə)n/

[8] I am using Householder's *x* notation here because it is unclear whether this refers to orthography or an underlying primary orthographic system. Other orthographic representations from Householder are unbracketed which makes this looks more likely to be representing an underlying orthographic rule.

Both of these options are single rules and both are specific to only one word. The second alternative though is more economical as it does not force the word through the set of rules (2.1 - 2.5) above which it would need to go through in order to gain its correct pronunciation. One of the more general orthographic rules Householder posits is:

x ⇨ *ks*

This is largely correct although initially, as in *xylophone*, there would need to be the following amendment:

$$*x* \Rightarrow \begin{cases} *ks* \\ *z* \text{ if word initial.} \end{cases}$$

The revised rule is fundamentally correct and generalises well throughout the language. It is unfortunate that Householder cites examples which do not do justice to the concept he is trying to convey - a concept which does appear to be fundamentally correct.

Householder points out that the argument which is used by those who wish to attack this position is that these principles are only acceptable for rare or obscure literary vocabulary but not for the irregularity of frequently-used words. Taking the examples *could*, *would* and *should* Householder gives the S⇨P rule:

ould ⇨ /-ud/ before #

The alternative P⇨S rule requires bracketing:

$$/\text{-ud}/ \Rightarrow \begin{cases} *\text{-ould}*/\text{if modal} \\ *\text{-ood}* \text{ elsewhere} \end{cases}$$

The economy of the S⇨P rule over the P⇨S rule is evident here. Overall, Householder shows that the tendency is for rules to be simpler if writing is primary with the pronunciation being derived from it.

Further examination of this involved use of 143 of the most common words (Householder's source is Kucera and Francis (1967)). The words are looked at in terms of economy of rules from both the P⇨S perspective and from S⇨P. In the S⇨P direction Householder notes that of the words listed, 60% can be handled by general rules.[9] Householder believes that of the remaining 40%, thirty special rules would account for the irregularity (around half the number of entries required to list the irregular words: 40% of 143 words would give 57.2 listed words compared to 30 rules). With some of Householder's proposed rules, though, the means of achieving regularity causes some scepticism as they do remove the benefits gained from having the orthography as the underlyer because they involve changing underlyers to fit the system, rather than vice versa (see Chapter 4 on SPE doing a similar thing). For example, the word *gas*, it is suggested, would be represented as *gass* with the final *s* being deleted in word final position after the correct pronunciation /gas/ has been assured. The motivation for this is to differentiate the pronunciations of *has* and *gas* which obviously share the same spelling for two distinct phonological rhymes. In the proposed system final *s* would yield /z/ where *ss* would yield /s/. This follows a logical pattern in that <ss> is always /s/ where <s> can be /s/ or /z/ as these example show. But the underlying orthographic form is manipulated to give the correct input for a system which will produce the correct output. This weakens the position of orthographic primacy. Any additional information being assigned to a word which changes its underlyer arbitrarily with no generalisation being captured should not appear in a grammar. It seems more logical to list *gas* as /gas/ and have *has* follow the standard pronunciation rules, or vice versa; or merely list *gas* as /gas/ and *has* as

[9] Wijk (1966) notes that of the 1000 most common words only 160 can be considered irregular.

/haz/ and do away with all the rules. There seems to be no benefit to the production of an underlying orthographic form which does not correspond to the orthography for the simple reason that the abstract underlyer has to be stored and, if economy is relevant, this is no different to listing the specific pronunciation for the word - a solution which has in its favour the fact it is non-arbitrary.[10] If an underlying orthography is to be posited it must be just that: a system where orthographic underlyers are unmodified and other means differentiate pronunciations. Only in this way is there a benefit in economy at the individual word level as the spelling is known with the pronunciation derivable from it. If the underlyer differs from the spelled form then the spelled form must also be learned along with the modified underlyer which removes the economy benefits. For example consider the following options for a system:

MODIFIED UNDERLYER SYSTEM		NON-STANDARD LISTING SYSTEM	
Spelled form	<gas>	Spelled form	<gas>
Underlyer	*gass*	Listed pronunciation	/gas/
(Allows production of	/gas/)		
Spelled form/underlyer	*has*	Spelled form/underlyer	*has*
(Allows production of	/haz/)	(Allows production of	/haz/)

The phonological forms derived from the underlyer should perhaps not even be listed as they would be automatic in such a system. The argument against the listing system would doubtless be that <gas> and *gass* (from the left column) are two pieces of information as are <gas> and /gas/ (from the right column), so what difference does it make? The economy of the right-hand solution though is that /gas/ does not need to be processed by any rule mechanisms where *gass* does, i.e. the underlyer must be put through a process to give the surface form. The right-hand system therefore must be more efficient as irregular words are listed as such rather than changed into

[10] A better solution would be to involve criteria such as syntactic category, with nouns spelled <-as> being /-as/ and verbs spelled <-as> being /-az/.

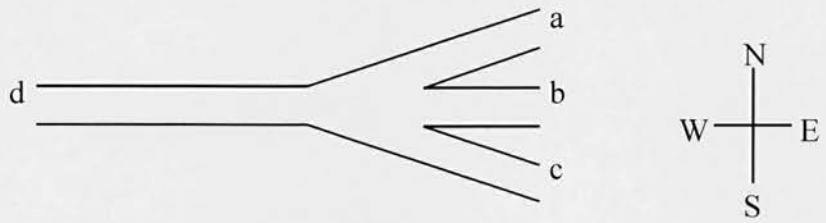
regular forms which are then converted through rule application to the form which agrees with the pronunciation - a laborious way of reaching the pronunciation. If simplicity, generality and economy are to be adhered to the right hand solution has to be preferred. This area is further discussed in Chapter 4.

Householder's examination of the issue from the P⇨S perspective uses the same word list (page 260). Of the 143 words, 77 could be accounted for under general rules (compared to 83 in the other direction) so there is some small advantage to system which moves from S⇨P. To account for the remaining words, some forty *ad hoc* rules are required, otherwise they must be listed. In this case the rules are more economical than listing as listing would require 76 entries (compared to the 40 rules). Interestingly, Householder is advocating the use of 'special' features such as [+ function word] for use with the rules from S⇨P, which as he says would remove the need for some rules, i.e. this would prevent *do* having a double <oo> when the spelling was derived from the pronunciation. Why Householder does not consider the use of syntactic information as a dichotomiser for the S⇨P direction (which could be used as a method to limit the application of rules to certain categories within the lexicon) is a mystery. A summary of the statistics from both directions according to Householder is:

	SPELLING ⇨ PRONUNCIATION	PRONUNCIATION ⇨ SPELLING
Words which can be accounted for with general rules.	83/143	77/143
Number of rules and/or listings.	30	40

Obviously S⇨P is more general than P⇨S, with more words being accounted for by general rules and also in favour of this system is the fact that there are fewer special rules or individual listings required. In short S⇨P is more economical than P⇨S.

The reason for this relative simplicity of rule formation from the direction S⇨P comes from the fact that in English there are around 30 (to 40) individual phonemes but these correspond to around 109 graphs (1970: 261). The problem is obvious: there is no one-to-one correlation between the graphs and the phonemes (biuniqueness failure). P⇨S as an approach is trying to convert 30 to 109 where S⇨P is converting 109⇨30. The following analogy exemplifies the problem in a very simple manner:



The diagram above shows a road. Travelling from East to West is a simple process of following the road to the destination. Travel from d to c though would require directions or a map. In other words, finding destination d from a, b or c is automatic, no map is required and in fact the destination does not even need to be known, i.e. anyone heading West from either a, b or c will get to d even if they do not want to go there, just by following the road. Coming from d to any of the other three places though is a more complex issue. Not only is a map required, but the destination must be known at the outset or there is no guarantee that we will have reached the correct place. So travel from East to West not only requires no directions, but also the destination does not need to be known. Returning to the primacy issue, the same problem is encountered in both the S⇨P direction and the P⇨S directions, but the overall problem is less from the S⇨P direction. As Householder says 'rules leading from 109 to 30 have a much better chance of simplicity and exceptionlessness than rules going from 30 to 109' (1970: 261). The principle of this issue as it pertains specifically to lax vowels and schwa will be dealt with in detail in Chapter 3. For

now though the principle of the movement in both directions is all that is of relevance.

The overlap of sound/spelling correspondences is a cause for concern for Householder in that it does not allow any spelling (or sound) to be associated with one and only one member of the other mode, i.e. <oe> can represent both /e/ and /o/, while /i/ can be represented by <oe>, <ee>, <eo>, etc. There are no mutually exclusive pairs. Householder posits the idea that to cope with this issue the protophonologist may make up some kind of feature representation to account for sounds and spellings in a one-to-one manner, with orthographic and phonological rules being intermingled to give the correct outputs for both the orthography and the phonology, again with the orthography holding the more primary position. This moves into an area again which dwells too heavily on abstractness, but more than this it does not tie in with what is now known with regard to reading and literacy acquisition (see Chapter 2).

Householder's conclusion is that writing is the primary stored form. From this underlyer both the orthographic form and the phonological form (and allophonic variations, etc.) can be produced. The status of writing is studied in much greater depth by Householder than his predecessors and although the discussion demands a lot of latitude from the reader, the basic premise appears to be correct. The use of syntactic information and reference to the Morpheme Spelling Principle[11] would doubtless have strengthened his position on the issue, but hopefully the following sections will resolve some of the problems Householder did not overcome. Householder (1970: 251) writes: 'let us get it clear at once that logical priority has nothing to do with temporal priority, whether ontogeny or phylogeny'. As was stated at the beginning of this section, it *ought not to be the case* that writing is more primary than phonology. But, according to Householder, and for other reasons which

[11] The Morpheme Spelling Principle is discussed in section 3.8.2.

will become apparent as this thesis continues: orthography is primary whether speech ability in man pre-dates it or not.

1.3 Kerek: The Spelling Pronunciation Tendency.

> In societies involving universal or near-universal literacy, where functional load of the graphic-visual mode in normal communication may equal (and even surpass for some individuals) that of the phonetic channel, and where the ultimate extent of graphic interference in linguistic coding can't as yet be envisioned. Kerek (1976: 324)

Kerek (1976) examines the phenomenon of SP and the effect literacy in a society. His aim is to not only account for SP, but also to show why it will become more prevalent. The paper begins with the observation that SP is at one end of a continuum which has pronunciation spellings (or naïve spellings) at the other, e.g. <nite> for *night*, etc. The relationship at these extremes is described firstly as an iconic relationship between spelling and sound and ultimately as isomorphism in the two modes. The OED defines an 'icon' as 'a sign which has a characteristic in common with the thing it signifies'; and an 'isomorph' as '[something] exactly corresponding in form and relations [to something else]'. Kerek suggests the prevalence of both SP and spelling reform are the result of the isomorphism at these extremes of the continuum, extremes which incidentally he believes the language is tending towards. The words 'iconic' and 'isomorphic' are used relatively interchangeably in Kerek's work, but do these two things really mean the same thing? Isomorphism must surely be seen as a more fundamental relationship than iconicity for the simple reason that the latter does not make the claim that it is the same as another entity, but rather that it shares some characteristics of another entity; whereas the former is describing an exact correspondence in form and relations. It is difficult to define the relationship between sound and spelling by either of the two, although intuitively it would appear that more of an iconic than isomorphic relationship exists as there is indeed sharing of characteristics, characteristics which will be manifested in different ways in the

different modes. Overall, though, the choice of vocabulary used by Kerek does not preclude the concept behind his paper: that there is a more fundamental relationship between the modes at the extremes of the continuum than at its centre.

Disregarding the confusing terminology, Kerek makes two valid points about SP: firstly, that SP is the result of the move from an oral to a literate culture, and secondly that SP has a regularising effect on spelling/sound correspondences. He observes people's tendency to 'say or think that the word ought to be pronounced in a given way, because "that's the way it's spelt"' (1976: 323) - a standpoint we are all familiar with. More profound than this though is that the position of spelling in a literate society, whether it is overtly acknowledged as such or not, is one of profound dominance, especially in those words which are not used on a day-to-day basis. Yet as Kerek discusses there is a denial of this reality within the linguistic community complemented by a strong objection to the position. The status of SP is in a constant state of siege from the linguistic community who attack it on the basis of the apparent sporadic nature of the changes made by spelling influence which are seen as very 'hit or miss, chancy affairs' in comparison to the 'smooth' progression of phonological change (1976: 324).[12] More emotionally based attacks involve name-calling with SP described as 'pedantic', 'grotesque', 'pseudo-cultured', 'going above and beyond the standards of normal linguistic decency' (Lambert (1972)). It is even described as 'subversive'! (Bolinger (1975: 402)). The issue of SP for some reason appears to be a 'hot potato', yet in a literate society it is as inevitable as a lack of SP is in a non-literate society. The vitriolic reactions to those who state a prominent role for orthography is based on one simple concept: to allow orthography into the system

[12] This reflects the anchoring effect the spelling. Words which are not commonly used and have fallen out of step with the spelling/pronunciation norms will have their pronunciation 'jerked' to a synchronic SP, admittedly a more violent progression than that of 'normal phonological change', yet surely just as valid when we understand what has occurred. For example the present day pronunciation of *waistcoat* is an SP, 'jerked' back from the degraded form /wɪskɪt/ which was in use until around the 19th century. Note the word is not returned to its original coining, but rather to a valid synchronic representation of the spelled form, which highlights the synchronic nature of SP. Kerek refers to this as 'partial reversal'.

usurps the status of phonology as the primary linguistic mode. In other words, if the spoken language is primary why would it be affected by the written from? This position is widely held, and is one which ultimately leads to the view that any impact of the latter on the former is 'grotesque'. The argument is hardly substantive, yet is the predominant position even today. The general endeavour of the linguistic community appears to be one in which the primacy of the spoken language is championed with the written form relegated to a secondary position where it is generally seen as nothing more than a way of representing speech. Yet even the repeatedly cited Saussure shows great awareness of the reality of the situation, a position more modern scholars try hard not to admit: the effect of the written form on the spoken language is described by Bolinger (1975) as a 'hazard of literate societies ... [although] literacy is too recent a phenomenon to reveal long-range effects'. The preponderance of evidence available though gives a fair insight into what is well underway in the language. This is the area Kerek focuses on.

1.3.1 Evidence of the Systematic Influence of Orthography.

> Since its inception writing has enjoyed popular prestige and authority, and has served as a model of highly-valued linguistic form... its impact in 'alphabetic' languages is no longer just a matter of conjecture. Kerek (1976: 324-325)

Since the advent of more modern linguistic analysis, a far greater amount of information is included in linguistic analysis: regional background, educational level, age, sex, ethnicity, etc. What is unusual is that the expansion of the group of parameters which are relevant to linguistic study has not generally been extended to the visual form. As Kerek (1976: 324-325) notes, its influence is 'no longer a matter of conjecture', yet even the obvious evidence does not ease the general distaste for the issue.

Kerek's view is that phonologically relevant sound change occurs when the normal operation of the phonological system is disrupted, a situation which SP can trigger (Kerek (1976: 325)). The sequence of events follows the pattern:

(1) SP is introduced as a variant pronunciation of a morpheme.
(2) these SPs may partially reverse some phonological processes.
(3) The SP begins to block the application of phonological rules.
(4) This may lead to the loss of the other pronunciations and ultimately a restructuring of the synchronic underlyer to one in step with the orthography.

It is an interesting concept: competition between SPs and other pronunciations, and it is likely to be the way the process actually works, a situation that is ultimately exactly what Dr. Johnson advocated at the time of his dictionary. He says in the *Preface* to the dictionary, 'In pronunciation, the best general rule is to consider those as the most elegant speakers those who deviate least from the written word'. Is this the way English is in fact moving? The possibility certainly exists. What is interesting is that there is a cumulative effect of the process outlined above. Every time it occurs, the correspondences at the SP end of the continuum described at the beginning of this section are strengthened. In other words: the more that SP occurs, the more regular it becomes, which in turn makes it occur more frequently - and so on. Perhaps when literacy is even more embedded in our culture and has been for generation after generation all but a very few words will be pronounced other than as they appear. SP will become the norm. This view is in essence one Kerek himself also holds.

To exemplify the process at work Kerek examines the position of the graphemes <th> and its iconic value /θ/ (and initially in function words: /ð/). What Kerek points out is that there is a levelling tendency of the more dominant phoneme for a given graph or set of graphs, in this case /θ/ (and /ð/) for the graphs <th>. He gives examples which have been affected by this levelling force since the words were borrowed from French, i.e. *theatre, theme, throne, author, anthem,* etc. At the time of borrowing (13^{th} - 15^{th} centuries) all of these words were spelled with a <t> where

there is now <th> (although <th> was a variant spelling) and phonetically they all had [t] instead of a dental fricative. In the 16th century, following classical models, the <th> replaced all the <t> spellings and the SP involving the fricatives emerged as a variant. Present day English has no variation with regard to the <th>, in that <th> will always be assumed to be one of the fricatives (as determined by rule), which strongly suggests the sequence defined in Kerek and described above has occurred in these words with the SP ultimately superseding the original pronunciation. As Kerek points out, looking at the events in this manner may show that there is 'a coherent pattern of analogical levelling within an orthographically defined paradigm' (1976: 326), and that as such the changes are less random as the overall effect and tendency is examined. In practice all but the most common words in English are likely to be affected by SP. The reason these words will likely be immune is because of their extreme levels of use which keep them firmly tied to whatever their pronunciation is. Other scholars[13] suggest it is because of their status as words learned prior to learning to read, however this would imply they are stored differently to the rest of the words which is unlikely. It seems altogether more probable that they are merely resistant to change through constant use.

On closer observation though there is problem. Kerek's systematic advancement of SP crucially depends on one thing: literacy in the populace. Why did we move from [t] to [θ] *in these words only*, if the <th> spelling is not relevant? There are a few possibilities: firstly, the move from stop to fricative is a well documented phenomenon in connected speech. This would account for the change, although we would expect a [s] to appear, because the lenition of [t] would normally give rise to [s] and more crucially we would expect it to affect all instances of [t]. The second possibility is that the [t] was aspirated giving enough of an aspiration for

[13] Vachek (1973) suggests this phenomenon causes layers within a person's vocabulary defined as 'native' (learned before literacy) and 'foreign' layers. Frequency of use, however, is the most simple and doubtless robust explanation as it also accounts for why there is so much irregularity in the most commonly used words also.

the two sounds collapse, i.e. [t] and [h], which would perhaps give the correct fricative or something acoustically close enough to cause people to mistakenly use the dental fricative - a highly speculative solution. The relevant point is this: how does the fricative get into general use within a small set of words? The people who could read would obviously be subject to the change as they would be aware of the <th> spelling which could allow a SP. But how does a person who does not read know where to put in the fricative and where to retain the stop? Is it phonologically driven with some kind of collapse as described above, or is it the spelling which causes a pure SP and if so how does it affect the illiterate populace? If this latter situation is the case it is odd because sociolinguistic variables tend to move from the lower classes to the upper echelons of society, e.g. non-rhoticity was once seen as slovenly and low and originated in the lower classes in London (Sweet (1888)) yet in the present day is a prominent aspect of Received Pronunciation. So why then did a change which could only originate in the higher, more literate, levels of society become common currency? Could more people read than we assume? Or can the whole process be accounted for phonologically with some other phonological information defining which of the [t]s should be converted? I have no solution to this enigma, and must leave the solution to this problem to someone else.

Other evidence cited by Kerek includes <ph> and its overwhelming interpretation as /f/.[14] He gives the examples *diphtheria*, *diphthong* and *naphtha*. In the OED these all now have as the primary interpretation /f/ for <ph> where historically the /p/ would have been more prevalent. Presently, only *diphtheria* has the /p/ as a possible variant. As Kerek notes:

> … the effect of spelling pronunciation is … regularising, though often counter-etymological
> Kerek (1976: 330)

[14] Not every <ph> can be interpreted as /f/, note the effect of the historical morphological boundary in *shepherd*, i.e. [ʃɛpərd] not *[ʃefərd]. This would surely need to be learned synchronically as there is no motivation for positing that this is a complex form.

Kerek also examines schwa when it is affected by SP.[15] His examples are taken from General American English and look at vowel quality when stress is assigned to a reduced vowels. He uses as an example *Oregon*. The local residents of Oregon have a [ə] in the final syllable of the place name, following the tendency to reduce unstressed lax vowels to schwa. However, American speakers not from Oregon pronounce the final syllable with the stressed vowel [a]. As GA has a grapheme/phoneme relationship between <o> and /a/ this must be interpreted as an SP, i.e. the <o> can not be interpreted as anything but /a/ for the literate American speaker who wishes to stress the final syllable of *Oregon*. Interestingly, Kerek considers the restressing of syllables such as these to be a sociolinguistic marker of the 'socially mobile and upward-bound 'second highest social class'' Kerek (1976: 330).[16] Kerek implies that the social value of literacy drives a process which counters phonological change, instead reinforcing the relationship between sound and spelling through promotion of SP.

The re-emergence of historically neutralised segments is also an effect of SP. One such re-emergence is the /l/ re-insertion in American English in examples such as *folk, yolk, walk, balk, stalk, calm*, etc. Historically the etymology of these examples involved loss of [l] in environments following late Middle English *au* and *ou* before the consonants *m, f, v* and *k* (Dobson (1957: 989)). The synchronic re-emergence of the /l/ is due to the influence of the spelling. Unetymological /l/ <l> also appears in words where they follow by analogy the etymological forms, i.e. *soldier, emerald, pulse*, etc. Kerek suggests SP accounts for both groups. However, once again when we consider literacy levels in the population can this really be the case? What Kerek proposes is that in the latter set of words, the spelling was changed by addition of the <l> due to analogy with the other set. This then promotes the SP with the /l/. But again, if the population was not literate how could this come about?

[15] Cf. Giegerich (1992a).
[16] Following Labov (1972).

The data is again open to the two interpretations, (1) that more people were literate than is assumed, which is unlikely; or (2) that the /l/ appeared first in the phonology then was added to the spelling. If the latter is the correct solution, which it is likely to be, then the same phenomenon surely is not occurring because in the etymological cases there is /l/ deletion in late ME which has subsequently come full circle in the present day, and has been reinstated due to the tendency to want to represent every graph by a segment, in literate cultures. The unetymological historical group is the opposite because it is a pronunciation spelling of the <nite> type mentioned above, but more than this the environment for this is phonological. It does not need to be spelling-driven because the change occurs in certain phonological environments: after the relevant vowels in all environments except those where the /l/ is deleted. In other words the two processes are manifestations of far ends of the original continuum. As all similar phonetic environments will be affected in the same way there is no need to posit a spelling rule to account for this historical situation. The environments are defined by the following segment, i.e. unetymological forms would only occur in the forms that were not followed by *m, f, v* and *k.* The coining of the new and unetymological /l/ forms then can be seen as driven by the phonology with the spelling eventually following.

In present day American though the effect is observable in that the pronunciation follows the spelling, with the phonological underlyer modified to reflect the /l/, /folk/ for <folk> etc. As Kerek says:

> The point here is that spelling pronunciation honours only the spelling, and not the historical reasons for the absence of any phonetic value for it; while it can almost 'systematically' destroy (by repeated blocking) the effectiveness of a synchronic rule, it no more strictly reverses all cumulative historical changes by design than by chance. Kerek (1976 :331)

This is one of the crucial aspects of SP. Although Kerek never explicitly states the fact, SP is a synchronic phenomenon, active only in terms of synchronic correlations

between sound and spelling. As a result of this adherence only to synchronic correlations SP is not concerned with etymological distinctions. Those words which become SPs, therefore, in effect have their etymology deleted - except of course that the SP becomes part of their etymology. If the state prior to the SP is not documented though, it will become irretrievable from the new phonology.

Kerek's ultimate view is one where SPs will become more and more prevalent until every word is an SP. Although the tendency is definitely there, it is unlikely the most common vocabulary of English will change to become SPs. The question is: why is SP a factor in pronunciation at all, never mind an advancing phenomenon?

1.4 Ehri: Spelling and Reading.

Ehri (1984) endeavours to ascertain a link between orthography and phonological development. The study begins with a definition of what the writing system does for a speaker of a language:

> ...when children learn to read printed language, they become able to visualise what they are saying and hearing. [...] A visual-spatial representational system is acquired by the mind for perceiving and thinking about experiences which can not be seen and which have temporal duration rather than physical extent as a basic property. Acquisition of a spatial model offers several potential advantages. It enables the possessor to hold onto and keep track of phenomena which themselves leave no trace or have no permanence. It imposes organisation upon the phenomena by specifying units, sub units, and interrelationships which might otherwise be difficult to detect or discriminate. However, some degree of distortion or inaccuracy may also result because properties of space may not be completely isomorphic with properties of the nonspatial modality, and also because the spatial system, being a cultural invention, carries no guarantee that it is perfectly conceived.
>
> Ehri (1984: 119)

This fundamental aspect to learning to read is a central issue to the study. The paper examines the idea that a visual representational system for speech is acquired when

children learn to read and spell and that the acquisition of this system has powerful implications for the speech of the children.

According to Ehri, the written system which is acquired has two sub-systems, one embedded in the other. The first is a 'horizontal sequence of letters separated by empty spaces' which symbolise words. The second system is the individual letters within the words which 'symbolise phonetic segments which are blended together in pronunciations' Ehri (1984:120). The relevance of the Morpheme Spelling Principle[17] is also indirectly brought into the discussion, although it is more a description of it:

> Print maps systematically at both the lexical and the phonetic levels. Lexical symbols are in one sense more reliable than phonetic symbols since specific word spellings represent the same referents constantly whereas letters singly or in combination may symbolise more than one phonetic referent or they may lack a referent in speech. However, it is important to note that although there is variability in grapheme-phoneme relations across different word spellings, there is little variability within specific word spellings since letters are fixed by convention in English. Ehri (1984: 120)

Cited to exemplify this is the phoneme /f/ which can be represented by <f> or <ph> depending on the spelling of the word in which it appears (fuss, Philip). For any of a given word's alternant forms there is rarely (if ever) a switch between other possible graphemic representations of a given phoneme, e.g. *sphere~spherical* is almost universal, where *sphere~*sferical* is not. These three aspects of language form the basic framework which Ehri then examines.

One of the prominent aspects of this paper is the effect of printed language as an aid to speech perception. As Ehri notes, speech is a non-discreet auditory signal. Not only are individual speech sounds not segmented out or signalled in any way, but also words themselves do not display the obvious boundaries that appear as spaces between the same words on a written page. Also briefly discussed are the aspects of connected speech which have a great effect on a word's pronunciation, e.g.

[17] The Morpheme Spelling Principle is discussed in section 3.8.2.

assimilation and coarticulation of sounds, as well as the difference in pronunciation a word manifests when it is pronounced in isolation. The point Ehri makes is this: although words can be moved around and substituted, allowing a speaker to distinguish words, there is less likelihood that the sounds from which the words are comprised can be isolated without the use of print. Ehri's fundamental statement on this issue is:

> ...in the absence of print, there may be little reason to undertake such an analysis. Ehri (1984: 121)

This is a highly relevant and somewhat controversial point.[18] However the nature of the statement is, from a logical perspective, very obvious. Why should a speaker go below the morpheme level into the phonology? Apart from morphological alternations, which could all be listed, there is no benefit for the non-literate in attaining a phonology as it does not allow a significant saving - especially when the amount of work needed for the development of the phonology is balanced against what is gained. As will be examined in later sections the situation is less to do with a decision on the part of the speaker not to go below the syllables level as much as it is a lack of the relevant trigger for development of lower level phonology, i.e. literacy. Ehri (1984: 121) observes that the relationship between speech and writing is 'intimate and possibly interdependent'.

As has been previously discussed, the role of orthography in speech processing (and the generation of phonology) is an area which courts controversy in the linguistic community. The general position seems to marginalise orthographic influence. This caused Ehri to look to research in psychology on the effect of print on speech in children learning to read. The debate in psychology, according to Ehri (1984: 121) is whether print 'shapes or merely reflects what develops in speech'. The focus, as a result of this, is on the child's developing knowledge of the structural

[18] Chapter 2 below examines this concept in greater detail.

units of speech. There is evidence from this approach which shows a strong correlation between reading acquisition and a child's ability to break sentences into words and words into phonetic units. Ehri cites three interpretations regarding this correlation which have emerged in the field of psychology (1984:122):

(1) a child has a structural knowledge of speech which is at a maturity level between the ages of five and seven which gives the correct readiness level to allow the child to learn to read.
(2) the linguistic segmentation skill for separating words is a consequence of learning to read. (A view which ties in with the ideas put forward by Jaeger (discussed in 1.5 below) where the writing system allows connections to be made that were previously unavailable).
(3) more general maturation of all cognitive factors allows segmentation ability and reading skill development as part of logical operational thinking skills.

The first of these interpretations gives the orthography a passive role, the second an active role and the final option removes the orthography entirely and replaces it with logical cognitive maturation. The latter at first seems to be the most likely as reading is not a necessary part of speech. But the position is not as clear cut as this. Experiments undertaken by Morais, Bertelson, Cary and Alegria (1979) examined Portuguese literate and illiterate adults and their ability to do a phonetic analysis task. The task was to add or delete segments to the beginnings of nonwords. The literate speakers could perform this task with ease, where the illiterates could not. The fact that this study examined adults shows that the development of phonetic units in speech is not a natural development of the maturing mind, but rather that it is conditional on learning to read. The first interpretation is invalidated by this same study, which leaves the second solution the most likely: literacy has an influence on phonological development.

The discussion in the psychological community also addresses the role of print in the representational system in memory, i.e. what is the role of the orthographic information in the memory. One view is that when someone learns to

read, the associations between visual forms of words and their semantic referents are learned. The word becomes a visual *gestalt* which is stored in memory, i.e. the word is the basic unit. Within this theory the phonetic information is kept apart from the information stored in the word which is seen as a unit of speech, but there is no impact on the speaker's phonetic representation of a word. As such there is no way to account for SP as there is no interaction between the word unit and the phonetic element. The second proposal is that a child learns to read by converting letters-to-sounds, then recognises the pronunciation from the parts. To produce the correct form any incorrect elements are changed, for example /kɪ.a.tɪ/ → /kat/. Ehri refers to this as the 'recoding (or decoding) view of word recognition'. The visual representational system is quite limited under this view because the letter-to-sound relations are what is stored in memory, not the words themselves. This view has to be incorrect purely on the basis that words can be read so quickly. Single letter scanning would be a necessity under such a theory but as Kolers (1970) shows there is no evidence that fully literate adults scan letter-by-letter. As Ehri (1984:123) notes: none of the theories admit the possibility that 'printed language might become established in memory as a visual representational system for speech'. Another weak factor in the psychology-based theories - from Ehri's perspective - is the lack of acknowledgement of spelling skill as a different entity to reading skill.

In order to try to address this issue, Ehri endeavoured to formulate a theory of printed language acquisition to establish how children learn to read and spell. The basis of the theory is that children acquire and store in memory the full representational system offered by the printed language during acquisition. The alphabetical images are stored in memory within this theory as lexical representations. The letters in these representations are learned as symbols for sounds both for the specific words and also as general rules. The beginner's knowledge is assumed to contain a lexicon which is based purely in their experience with speech.

This lexicon contains word units which have several identities: phonological, syntactic, semantic and, when the speaker learns to read, the alphabetic image of the word. At this point, it is suggested, these identities become integrated to form a unit of lexical memory (a process known as unitisation), i.e. the letters become visual representations of sounds and sequences (words) become visual representations of both sounds and the relevant semantics attached to the word. So when a person reads, the alphabetic, semantic and syntactic identities give meaningful representations in sentence contexts due to this unitisation across the identities.

The alphabetic information is thought to enter the memory as a systematic relationship between acoustic and/or articulatory segments which are detected in the word's pronunciation. The theory assumes that the first few times a printed word is seen, its component letters are processed as symbols for component phonetic segments. This letter sequence then enters memory where it becomes a visual symbol for the sound structure of a word. This process, known as Phonetic Symbolisation, requires that in order for the reader to store images they must be able to analyse words into the relevant phonetic segments which are suggested by the letters. As Ehri also points out, this requirement to know the correlations between sound and spelling could also be used for the production of 'approximately correct spellings' Ehri (1984: 124). Overall the basis of the theory is that word spellings are stored in memory with the individual letters representing symbols for sounds. This principle in mind, Ehri endeavours to find evidence to reinforce the position.

There is some evidence which points to letters being stored in memory as symbols for sounds in pronunciation. Ehri (1984: 124) discusses a child's ability to recall nonsense syllables - a task young children have great difficulty with. To help (or hinder) the children with this learning task the children were given one of three physical rehearsal aids: a correct spelling of the word they were to learn, an incorrect spelling for the word, or an oral spelling. The test was trying to establish whether

there was any benefit to having the spelled form for a speaker learning a new word. With one of the three rehearsal aids the children were given a period to study words and then to recall them. The results show that the fastest recall times were found for those words where the correct (standard) spelling was given for the word in question and the worst results were found if an incorrect spelling was given for a word, i.e. when the supposed orthographic form did not correlate with the pronunciation the child had the greatest difficulty. This at first seems a very obvious result, however if the written form had no bearing on the learning then there would be no difference between the correct or incorrect spelled forms. The interpretation of the data is that the spellings improve memory for sounds as they are retained as visual symbols which help to preserve the sounds in the memory.

Next Ehri looks at the way spellings shape the conceptualisation of sounds (1984: 125). The idea under examination was that if spelling information was stored then letters in some capacity would be interpreted as symbols for sound. If this is the case, then the spelling may produce rogue phonemic information, for example in the word *pitch* the graphs and combinations of graphs suggest four phonemes /p/, /ɪ/, /t/ and /tʃ/. When this is compared with the rhyming form *rich* the object of examination becomes obvious. The /t/ appears in both (as part of the affricate in the latter), but the spelling may prompt an extra phoneme - under the proposed hypothesis. The results of the experiment showed the hypothesis to be correct: extra phonemes were detected in the forms with a reinforcing grapheme (*pitch* style forms) while in the forms where the extra graph did not appear (*rich* style forms) the extra phoneme was never posited.

Another interesting aspect of the study was that the children were able to spell many of the target words, although it was the misspelled words that were of the greatest interest. It was established through cross-reference of the misspellings and the results (where an extra phoneme was not observed), that in 90% of the cases there

was a correlation. In other words the children had not posited the extra phoneme because they did not know how to spell the word. The conclusion from this is that when children acquire orthographic symbols, they are likely to become aware of additional phonemes in the pronunciations.[19]

These experiments also highlight the tendency to utilise orthographic information in non-spelling related tasks. Questions about whether or not the <b> in *comb* could really be heard were asked, even although there had been no mention of the spelling. Another factor of note was that silent letters like final <e> were not usually assigned a segment and graph combinations like <ch> only had one segment assigned to them. This shows that the letters do not dictate the sound structures in a 1:1 fashion, but rather that there are other influences that give the correct pronunciation (phonotactics, spelling norms, digraphs, etc.). The intricacies of the spelling system are highlighted here.

Ehri (1984: 127) also notes that the spelling can have an effect on the number of syllables into which a speaker will segment a word, e.g. *different*: three syllables, or two? Taking literate and borderline literate subjects, it is established that the spelling could cause the literate subject to posit an extra syllable, where the borderline literate subjects would not. This segmentation into a larger number of syllables can only be a direct result of the phonological values of orthographic units which again suggests a high degree of orthographic awareness in phonological operations.

Silent letters are a problem for any theory where the spelling is given a position of primacy. Ehri (1984: 128) suggests two possibilities for silent letters: firstly, that 'silent letters are incorporated into the pronunciations of words', and secondly, that silent letters are tagged as exceptions when a word is stored in memory. In order to establish how silent letters are processed experiments were

[19] Children also differentiate certain sounds for the first time on acquiring spelled forms. Children do not differentiate the first sounds of *truck* and *chicken* before they learn to spell (cf. Chapter 2)

undertaken to establish if silent letters are treated as normal letters without pronunciation correlates.

Seventh grade students were asked for their opinions on silent and pronounced letters. The feeling of seventh grade students was that silent letters were different as they did not have any sound attached to them. On the basis of these intuitions the first hypothesis was rejected (although the lack of phonological correlations to silent letters reinforces the accuracy of this). Subjects were then asked to read a list of target words to see which words were known to them. They were then asked to imagine how the words were spelled. When the subjects could 'see' the word in their head they were shown a single letter and asked if it appeared in the word's spelling. Then they were shown a letter, and asked which of the words that had been remembered and discussed earlier had the relevant letter in it. Pairs of words with similar or comparable spellings were used, one with a silent letter and one with a pronunciation correlate in the spelling, e.g. S - *island* versus N - *insect*, T - *whistle* versus *freckle*. The results showed a close-to-perfect ability to locate silent and pronounced letters in the imagined words. There was however slightly greater accuracy in the pronounced letters than the silent letters, which would suggest that the letters are more easily stored when they symbolise sounds - although this evidence is a little weak when the near accuracy of both forms is taken into consideration.

Ehri (1984: 128) also examines response latencies in tasks involving silent and sounded letters. In a similar manner to the earlier experiments, words were imagined by the subjects, then a letter was projected onto a screen. The time between the appearance of the letter on the screen and the response of the subject as to the letter's presence in the word was measured. The notable result from this experiment was that the latency for silent letters was shorter than that for sounded letters.

It appears from these two experiments that silent letters have a different status to pronounced letters, and that they are harder to commit to memory, but once learned they assume greater prominence in orthographic representations than pronounced letters. Ehri's assumption is that the greater prominence is due to tagging the letters as silent letters, a position which at first appears to contradict the *rich~pitch* extra /t/ segment. Ehri states that the interpretation of an extra segment in the pronunciation of *pitch* type examples exists because there is a correlation in the pronunciation, e.g. *pitch* does have a /t/ in it, which is a fundamentally different situation to the likes of <k> in *knight*. The status of silent letters is therefore seen as fundamentally different to the extra segment examples.

The next stage of the Ehri's examination involves a discussion of how this new visual-spatial system influences speech. According to Ehri the linguistic community holds the general position that speech is primary and that writing is 'parasitic' on speech. Ehri considers that the opposite may be correct and that speakers perhaps learn about the phonemic structure of words through interpretation of spellings as 'maps for pronunciation' (Ehri (1984: 130)). The problem is that there has not been a great deal of study to establish the relationship between reading and phonological development. Neither viewpoint has been adequately substantiated. To try to answer the question Ehri embarked on a segmentation training study.

The object of the experiment was to teach children phonological segmentation ability - a task that a child cannot perform through automatic development processes. Using groups of subjects who were not readers and could not phonologically segment prior to the experiment, each of the groups was taught segmentation in a different manner: the first were taught using alphabetical tokens (something along the lines of Scrabble pieces); the second group were taught with similar looking tokens, all of which had the same character on them (each had the same symbol for an ear on one side); and the third group received no training (a

control group). The subjects were taught to segment two phoneme CV and VC words into their constituent phonemes; and then three phoneme CVC words. Also tested was performance with sounds which had not appeared in the practice set to see whether the principles of segmentation would be transferred or whether all sounds to be segmented had to be taught.

The results of the experiment showed that the length of time for both of the trained groups to reach the mastery criteria was the same, which indicates that neither method of learning segmentation was more difficult or time consuming than the other. The control group did not develop segmentation ability at all. Examination of the errors made by each of the taught groups (hereafter referred to as the Letter or Ear group) during training showed that the Letter group was more skilled at breaking apart the words than the Ear group. Perhaps more relevantly though, the Letter group were less prone to intrusion of incorrect sounds in their segmentations than the Ear group. This highlights the benefit of the unique visual quality of the letters of the alphabet and the limitation this has on what sounds are possible within a spelled form.[20] Both of the taught groups were able to transfer their segmentation principle beyond the bounds of what had been taught, which shows that segmentation can be taught without an alphabet as effectively as with an alphabet. The significant difference emerged with the Letter groups use of the trained sounds. The Letter group was superior to the Ear group in segmentation of sounds they had practised (even although both had started out at the same 100% level). The results therefore show that all things considered, alphabetical letters are the best way to learn phoneme segmentation.

The most pertinent aspect of this study is that it shows that segmentation can be taught without the alphabet, which is of crucial relevance to the historical development of the alphabet, because without this possibility, there is a circular

[20] Although obviously as the child gets older the letters do signify different sounds in many cases. Although the Morpheme Spelling Principle does limit this apparent problem.

enigma[21] which is irreconcilable: how could alphabetical writing have developed when it obviously needs phonemic information which is only attainable through alphabetic literacy? The issues involved in this discussion are dealt with in section 3.6.1 below.

1.5 Jaeger: Abstract Representation Acquisition and its Problems.

Jaeger (1986) examines the psychological reality of Abstract Phonological Representations[22] (APR) within the lexicon. The standpoint of the paper at the outset deems APRs to be an unlikely reality for a speaker. The first motivation for this is the initial problem a speaker has to overcome in order to produce APRs, i.e. the minimum information the speaker would need and the relationship generalisations the speaker would need to produce the APRs. Jaeger defines the following three linguistic criteria which a speaker must meet to produce APRs (1986: 72):

> (1) the subject must know the relevant vocabulary (see section 3.2.3), i.e. 'know words which contain various allomorphs of the same morpheme'.
> (2) the subject must relate these forms on the basis of semantic and phonological criteria, i.e. they must be recognised as allomorphs of the same morpheme.
> (3) the subject also must 'recognise recurrent phonological patterns in different allomorphs, so that these patterns can be abstracted as rules'.

Only by meeting all three of these criteria could APRs even be considered as a possibility for a speaker. But when these three points are examined, even just cursorily, the magnitude of what a speaker has to do becomes apparent, which in turn makes the likelihood of APRs alarmingly unlikely - more fundamental than this though is the question of how likely it is that everyone manages to meet the criteria. This possibility is even more remote. More relevant to a scholarly approach to the

[21] See section 3.6.1.
[22] Abstract Phonological Representations of the type introduced by SPE. See Chapter 4 for detailed discussion of APRs.

issue is that, according to Jaeger, child pronunciation differs from adult pronunciation in that children can not be assumed to be able to meet any of the above criteria because (a) they are not likely to come into contact with the relevant vocabulary and (b) the child's general lack of cognitive maturation required for criteria (2) and (3) above. This suggests their underlying formation is no more complex than the surface forms they produce (accepting changes due to pronunciation limitations a child has or may have). Jaeger then introduces one of the fundamental issues of the paper: when does the child begin to reanalyse their underlying representations, restructuring them in terms of APRs? If a child is assumed to not utilise APRs and an adult is, then this change must be assumed to occur.

1.5.1 Psychological Reality.

One of the fundamental tenets of theories which support APRs is that storage space in the brain is at a premium. On this premise, it is assumed that related forms are stored under the same abstract entry while still maintaining maximal surface outputs through the mind's ability for 'spotting and extracting regularities in phenomena and formalising them into rules' (Jaeger (1986: 73)). Refining this basic concept the human mind can be seen to operate crucially on the principles of 'simplicity', 'economy' and 'generality'. There is one fundamental flaw in such a position (although there does seem to be some need for these three maxims): it is difficult to assume memory space is at a premium when everything a person remembers is taken into consideration. Is this good use of memory? Or is it the case that an infinite number of entries can be stored in the brain? This latter situation seems to be more likely considering encyclopaedic knowledge. Despite this, those who support a theory of Abstract Underlyers see beyond this problem, instead focusing on more favourable aspects of the theory. Most notable is the regularity in the effectiveness of rules

across various morphemes which is seen to give the rules more validity. As Jaeger points out though, on inspection this aspect can be reduced to nothing more than a theory internal regularisation, with the whole system probably more accurately accounted for using 'general principles of the relationship between spelling and morphology'. On this basis Jaeger questions the psychological reality of generative grammar citing Ladefoged (1972: 282) as counter-evidence:

> The indications from neurophysiology and psychology are that, instead of storing a small number of primitives and organising them in terms of a large number of rules, we store a large number of complex items which we manipulate with comparatively simple operations. The central nervous system is like a special kind of computer which has rapid access to the items in a very large memory, but comparatively little ability to process these items when they have been taken out of memory.

This appears to be a very logical way for the system to be set up, although it appears to have been overlooked in the pursuit of producing a theory of generative grammar. The reality must be that the brain does not need to be economical as space is not at a premium.

Jaeger moves from this position to find support for a hypothesis that would show APRs are not utilised. She turns to studies of speech perception and production, such as confusion studies, speech errors, word association, etc., which would suggest that something close to surface forms appears to exist in memory and that the system does involve a great deal of redundancy. One paper cited as evidence (and as evidence against APRs) is Brown & McNeill (1966)[23] and their Tip-of the Tongue (TOT) experiments. Jaeger cites this paper because it shows that the information available to a speaker is not confined only to phonological information. She states, on the basis of the TOT experiments, that theories which assume abstract underlyers at the expense of more surface true forms would require a subject in TOT state to have generated the relevant word then forgotten it immediately leaving the residual trace

[23] See section 3.2.0.

elements which are available at the point of TOT. The counter-attack, from Generative Grammar, was that the surface form *as well* as the APRs and the relevant rules are stored. This seems a 'catch all' concept, however the productivity of some of the proposed processes cannot merely be ruled out in favour of listed information. As Jaeger points out the basic principles of 'simplicity', 'economy' and 'generality' are abandoned by taking this position.[24]

In the pursuit of the question of which solution seems to have the most psychological reality, Jaeger moves to a non-abstract, redundancy-rich viewpoint - the tendency for the simplest solution. She cites as examples the Maoris who prefer to memorise over a dozen different versions of the passive suffix, rather than accept an analysis in which the unaffixed verb form is not the basic phonological shape of the morpheme (Jaeger (1986:75)). On the issue she concludes that there is little evidence that speakers will perform abstract linguistic analyses for the sake of 'simplicity' or to save memory space; on the contrary, they show preferences for transparent, albeit uneconomical and exception-filled, analyses.

But there is a problem for Jaeger: the process of language acquisition seems to suggest a rule generating mechanism. The example she gives is the over-regularisation of past tense forms, which suggests that some kind of past tense default rule has been formulated, e.g. **bringed* instead of *brought*. As is pointed out, this and pluralisaton (another acquisition rule which tends to be overproductive) are the most productive morphological processes in English and their overgeneralisation does not automatically mean that rules, such as the Vowel Shift Rule (VSR), are part of a complex extrinsically-ordered set of phonological rules. The *bring-brang-brung* over-extension of the strong verb pattern is also attacked as not showing rule

[24] What is not acknowledged is that the position of the generativists may be correct. There does seem to be motivation for positing both viewpoints. It is a logical notion that surface forms are listed and that this is the primary lexical production mechanism, and that the generative rules are in fact some kind of residual information left by the acquisition process with this information being called into play at a conscious level when we encounter a new form or make a semantic link. This is of course just speculation though.

generation. As Jaeger (1986: 75) notes, this is more likely to be surface analogy with *ring-rang-rang* (cf. *sing*) than a reflection of rule development. The force of analogy could also apply to the pluralisation and past tense, a situation which does not require rules except the obviously phrased: add /s/ (or allomorphs) to nouns to give plurals; add /d/ (or allomorphic variants) to verbs to give past tense. In short the evidence seems to point to the conclusion that 'humans prefer to memorise as much as possible and have rule governed regularities transparent, and they find concrete solutions 'simpler' than abstract ones' (1986:76), a situation which would be in firm agreement with the statement from Ladefoged above.

Halle & Mohanan (1985) is concerned with the VSR and its central and apparently irreplaceable role in English phonology, and states: 'the evidence does not constitute proof that Vowel Shift is part of the synchronic phonology of modern English, [however] the facts adduced are of a complexity and variety that would make it extremely difficult to propose an alternative treatment without Vowel Shift'. What is overlooked in this statement is the obvious solution which Jaeger suggests: that the spelling system could account for the Vowel Shift alternants following standard spelling/pronunciation conventions and analogy. The reason this has not been accepted by Halle and Mohanan is because the position for APRs and rules is weakened if information like spelling is allowed into the grammar as the need for the APRs becomes less necessary. This can be seen as beneficial overall because it removes the need for the excessive abstractness of the APRs. If the two possible solutions are compared, Jaeger's solution is surely the preferred option. One reason for this is that a system which utilises APRs would require special treatment of non-alternating forms (free rides in examples such as ***about***) so they could fit into a system which has, on the grand scale of the lexicon, only a few pairs to justify the creation of the aforesaid abstract mechanism. If the spelling-to-speech theory is examined it becomes apparent that the system is nearly optimal because with the

application of stress, correct vowel quality is dictated by the spelling, e.g. how else could <divine> or <divinity> be pronounced? The spelling predicts the pronunciation in a very precise synchronic way.[25]

1.5.2 Do Children Have APRs?

Jaeger's study also involves an exploration of whether or not children have the VSR and understand the relatedness of word forms. The study involves an examination of the speech of Jaeger's daughter Anna. At the time of the study Anna was 3 years and two months old is described as 'somewhat advanced linguistically...[with] surface pronunciations almost identical to the adult model she hears most often'. The question posed by Jaeger was: could Anna abstract about the VSR and more relevantly, could she meet the criteria outlined above? Obviously the vocabulary was beyond a child of this age, however Jaeger did note that Anna was drawing morphological, phonetic and semantic relationships from her vocabulary although the connections were in a fluid state and far from what would be expected if an SPE style theory is assumed to be in place. For example the word *pencil* and *pretzel* (called [pʰrɪnsl̩s] by Anna) were related at a semantic level (including an overlap in pronunciation) because Anna thought pretzels were edible pencils. Another example was Anna's pronunciation of *air conditioner* [ɛrikəndɪʃənɚ], pronounced in this way because the airconditioner device was first encountered in a house belonging to a couple called Eric and ('n') Laurel. 'Ditioner' was considered by Anna to mean 'you get cold'. These both appear to be random relationships which show that order for the child is randomly based on any aspect, whether that be phonetic similarity (partial or complete), similarity of physical shape, where it was encountered, and doubtless a plethora of other possible sources for relationships. Jaeger concludes that Anna did

[25] Jaeger gives a brief outline of the purpose and form of the Vowel Shift Rule which will not be reproduced here as it is to be dealt with in Chapter 4 on SPE and the follow-up papers from Chomsky and Halle.

not have common underlyers for any of the apparently related words. Also, all the suffixes Anna used were regular and transparent, i.e. they did not cause allomorphy. All of this makes a strong case against the child utilising APRs. Jaeger gives the benefit of the doubt though and assumes for the sake of argument that the child has not yet reached the age when the APR mechanism is utilised. An examination of the next possible source of common underlying forms is then examined: the strong verbs.

Jaeger accepts that the vocabulary issue (Anna's lack of the correct vocabulary) may be the reason why she does not show vowel shift in the environments discussed above. But did Anna show APRs and the VSR in any other environments? Jaeger examined Anna's strong verb usage following the argumentation of Kiparsky and Menn (1977) which suggests strong verbs are the environments which cause the first use of the VSR.[26] The vowel shift pattern appears in basic vocabulary in this set, such as *bite~bit, feed~fed, hide~hid.* To establish whether Anna had knowledge of VSR Jaeger performed an experiment with Anna. An interactive story was made up which involved the use of strong verb alternations of which one was given by Jaeger and the other Anna was asked for. For example:

> M. Yesterday, Anna went to the swimming pool and she dove in.
> A. (pretends to dive)
> M. What are you doing?
> N. I'm diving in the pool!

This was taken as evidence that Anna knew the words were related. If a response such as **rosing* from *rose* was given this was assumed to mean no relationship existed for Anna. In total 143 strong verbs were examined along with journal entries Jaeger had been keeping since Anna was born. Of the 143 verb pairs Anna knew 71 of which 14 were Vowel Shift alternations. The majority of the pairs involved lax vowels in both forms of the verb. Jaeger draws the conclusion that Anna had not

[26] It is worth observing that these environments, e.g. irregular past tense, will also have to be specifically taught at a spelling level. Perhaps this also has a bearing.

drawn any regularities from the vowel alternation patterns as some of the words shared the same alternation pattern she had correct in other verb pairs yet Anna did not give the correct response. Analogy, rather than systematised rule application was the more prominent aspect of Anna's pairs. Jaeger concludes that Anna did not have APRs for the words and that they were more likely stored separately with some kind of semantic link connecting them.

There is no evidence that children use APRs or utilise rules such as the VSR. The next question Jaeger turns to is whether adults do.

1.5.3 Adult Speakers and the Vowel Shift Rule.

Jaeger tests the psychological reality of VSR with adult subjects to establish whether or not it is an actively productive rule for an adult speaker. The method used to achieve this was to give the subjects test words and ask them to add suffixes not normally found with the test word, then pronounce them. The words were selected because, according to SPE, the suffixes would cause the VS alternation to occur between the simplex and affixed form. The subjects, however, did not tend to change the vowel quality in the complex form, instead they preferred to add the affix to the test word without altering its vowel quality.

Jaeger cites other studies which also have relevance to this issue. Interestingly, Steinberg & Krohn (1975) and Templeton (1979) found that when the words were presented in written form, results were more in line with the predictions an SPE analysis makes. Also, if a model is given, this also improves the 'correct' responses. Altogether though the evidence appears to suggest that VSR is not an actively productive synchronic rule. The most interesting point here is that the results were improved by using the written medium. This suggests that the spelling system in some way helps to predict the vowel qualities of the alternating pairs.

Of greatest interest is Jaeger's brief discussion of Wang (1985) which tests various aspects of VSR. Wang's studies show that the vowel alternations which reflect the 'long' and 'short' variants of orthographic vowels are the most productive of the alternating forms, showing 'significant strength', i.e. the vowel alternations [ey]-[æ], [ay]-[ɪ], [iy]-[ɛ] and [ow]-[a/ɔ] appear to have a special status from the psychological reality perspective due to the fact that they are phonological alternants for the letters <a>, <e>, <i> and <o>, (cf. Section 3.2.1). Wang's conclusion states that the VS pattern is psychologically real, but the source of it is the orthography. Jaeger also tested subjects for evidence of VS in Jaeger (1980, 1984) where it was concluded that these four vowel pairs (the 'long' and 'short' variants) show the greatest psychological reality as they correspond to single letters in the orthography. The [aw]~[ʌ] alternation is not therefore part of the VS set as there is no single letter orthographic correspondent.[27]

The VS set appears to be related primarily to the vowel graphemes and the 'long' and 'short' vowels which are taught in schools. According to Jaeger, the lack of psychological reality of the [uw]~[ʌ] alternation may be resultant from the relative infrequency of this alternation and the irregularity of the spelling. This primacy of the spelling system as the source of the alternations is a potentially controversial statement to make as Jaeger's use of italics seem to highlight (Jaeger (1986: 91)):

> It is one thing to claim that adults' knowledge of VSR reflects their knowledge of spelling rules; but it is a much stronger claim to argue that spelling rules are the *original source* of this knowledge.

However, if the indications are that preliterate children show no evidence of knowing VSR, that the psychological reality of the alternations is heavily tied to seeing the written information, and also that the graphemically connected forms show the

[27] Which is reflected in the orthography for words which use this alternation, i.e. <ou>~<u>, so the alternation is 'written' in to any morpheme which would use it. Thus it does not need to be part of the VSR.

strongest psychological reality, then the whole concept for the orthographic source becomes quite a strong one. The only question left is one which Jaeger then addresses: does a child show awareness of the facts just before they learn to read, i.e. is the reading just reinforcing existing data?

Jaeger (1986: 91) gives three reasons why this does not seem to be the case: firstly, young children do not know the learned vocabulary in which the alternations occur, so could not really know the rules. Secondly, the variation in a child's knowledge compared with another child's seems to be so great that it is almost impossible that they would make the same connections and set up the correct rules, e.g. Jaeger's example of the connection made by her child with *Eric 'n' Lorrel* and *air conditioner* pronounced [ɛrɪkəndɪʃənɚ]. How would this have worked if Lorrel's partner had been someone called John? Anna's connection was based purely on phonological similarity even although the connection was erroneous. Thirdly, there is strong evidence that a child learning to spell shows no evidence that they are aware of VSR.

Jaeger refers to Ehri (1986) on this issue (see above and Chapter 2) which describes the acquisition of spelling as divisible into three stages: 'semiphonetic', 'phonetic' and 'morphemic'. The 'semiphonetic' is where the child uses the names of letters to create spellings, i.e. *elephant* can be perceived to begin with <a> (In GA there is apparently a correlation between <a> and [ɛ]). The 'phonetic' stage works on the principle that one letter represents one sound, and that words can be segmented into individual units. It is at this stage that the child first begins to analyse words as a sequence of sounds. Jaeger states that the most important and difficult part of the phonetic stage is learning the 'short' forms of the relevant graphs where, interestingly, the child ignores the 'long' sounds as they assimilate the relevant information.[28] These vowels are part of the VSR yet the children's treatment of these

[28] Aitchison (1995:128) discusses this propensity of children to temporarily put one aspect of language learning on hold while another aspect is concentrated on.

sounds does not suggest anything except that this is their first encounters with these units as sounds, i.e. there is no relationship prior to learning to read. There is also a great deal of evidence that words which are already known to the child are restructured based on the new orthographic information in this stage also. Groupings which were previously based on phonetic information are, at this point, regrouped on the basis of spelling patterns e.g. the initial sounds of *chicken* and *truck* which are treated as the same sound by young children become at this point 'different sounds'. The Final of Ehri's stages is the 'morphemic' stage, which eventually emerges as the children learn the spelling conventions. Morpheme based patterns become more and more relied on. This stage can be broken down into three further sub-stages: (1) a break from the one-sound-one-letter pattern; (2) learning to spell affixes, and where they can attach; and (3) learning that related words have related spellings, i.e. *sign* ~ *signal* (note this makes sure things like *fizzy* ~ *physic* will not be related in the lexicon, where for a pre-literate child they could be, cf. *air conditioner* above). The evidence even at this stage still suggests that children memorise individual forms rather than extracting relatedness and spelling convention. The rarity of a child producing an orthographic form such as <explaination> from <explain> highlights this.[29] The similarity of spelling convention increases as the subject gets older and uses the information more.

Jaeger concludes by stating that a child will move through the stages outlined above and will make and modify rules to account for as much as possible at any given point. She suggests the largest restructuring point appears to be on literacy attainment when complex alternations are added to the equation. As the reader matures the connections seem to make sense and the VSR for instance does appear to have greater psychological reality in the adult. Jaeger's final position on APRs

[29] I would guess, although it is a guess, that a large amount of our relating of morphemes is consciously achieved. We have all had experiences where we have noticed that a word is related to another, at which point a conscious connection is made.

suggests that the alternations are in no way grouped together *except* when the orthographic system is put into place, i.e. the morpheme spelling principle gives rise to the alternations through spelling to pronunciation conventions (especially VS alternations).

1.6 Overview and Intentions.

The purpose of selecting these studies as an introduction to the thesis is that they all help define the general linguistic climate regarding orthographic influence in the lexicon, while addressing various of the more prominent issues involved with the topic. The orthography has been a relevant and invasive aspect in the phonology for at least a hundred years, as the discussion of Saussure highlights. It is interesting how much discussion is dedicated by Saussure to a topic he eventually dismisses, but this highlights the reality of this issue: orthographic influence must be accounted for. Bloomfield's perspective on the issue is also of interest and perhaps shows the strong feeling of distaste for things such as SP pervading the earlier part of this century. The reference to writing interference in Bloomfield is interesting as he does not wish to acknowledge that orthography may be of linguistic relevance, yet he can not entirely extricate it from his discussion. Overall, the general feelings regarding the issue of orthographic influence have now been outlined. The topic is undoubtedly controversial. However, the evidence, the facts, which exist must be accounted for and can not be ignored. The more recent papers (from Householder onwards) introduce some of the more fundamental aspects involved with orthographic influence, and as such, each requires a brief note of the main issues from each paper.

Householder's discussion is one of the most effervescent about the possibility of orthographic primacy. His 'I-don't-give-a-damn' attitude to the issue drags the reader to an obvious and logical conclusion. The idea of rules which move in the most economic direction seems to be logical, if nothing else. The issue of phonology

derived from orthography is a recurrent theme in this thesis and is examined in detail and quite comprehensively in Chapter 3. Also, Householder's basic premise of orthographic primacy has been adhered to, hopefully with the account in this thesis substantiating and logically proving its likelihood.

The issue of SP is strongly argued in the review of Kerek, and is the most frequently-observed aspect of spelling influence in linguistic circles. Kerek's is perhaps an overstated view. However, the general principles of the language tending towards SP is a distinct possibility as literacy increases more and more in society. The theory suggested in Kerek regarding SPs competing with and eventually blocking conventional pronunciations is examined in Chapters 3 & 4.

Ehri's work introduces possibilities regarding the role of orthography, both in the development of phonology and in general storage and processing issues. Ehri was chosen to introduce these issues as it is (to my knowledge) the first work to try to establish a causal link between literacy attainment and phonological development. There have been various papers since Ehri's studies, which have been collated and form the discussion in Chapter 2.

Jaeger is included in this introductory section as her paper highlights the deficiencies of one of the most central parts of Generative Phonology: Abstract Phonological Underlyers. The lack of psychological reality which SPE shows in both APRs and the Vowel Shift Rule are central to the issue of orthographic influence. As Jaeger shows, the alternations appear to be introduced on literacy attainment. The likelihood of a causal link in this area also gives strength to the possibility that orthography attains a dominant position in the speaker's language mechanism. Jaeger's findings will be relevant throughout the thesis.

The remaining chapters examine the role of orthography and its relationship to the phonology from pre-literacy to full literacy. Chapter 2 examines pre- and early literacy, to establish what levels of phonology speakers have before and as they

progress towards being literate. This chapter also examines methods of reading employed by a new reader as they try to ascertain what the best method is for learning to read. The conclusion of this chapter superimposes reading methods and phonological abilities across various age brackets to highlight the link between the two sets of information.

Chapter 3 continues the discussion, but is only concerned with the fully literate individual (a somewhat ideal literate individual, it must be said). The endeavour is to establish whether or not the orthography is relevant to the fully literate speaker for production of phonology. The chapter begins with a number of papers which suggest a strong link between the modes for the literate, with the latter half concentrating on how the speaker must reconcile the orthographic and phonological information to show the versatility and productivity the literate is capable of.

Chapter 4 is an examination of SPE and the use of orthographic devices towards phonological ends in the SPE theory. The similarity between SPE underlyers and conventional orthography is examined to establish why the similarity exists. The Vowel Shift Rule is also examined in detail to ascertain how an orthographic solution to the issue might be employed. The chapter concludes with a definition of SP and its possible motivation.

Chapter 2

Pre-Literacy[1] and Learning to Read.

2.0 Introduction.

There is one question which is of paramount importance to the issue of orthographic influence on a speaker's phonology: What does a speaker's 'phonology' comprise prior to the speaker becoming literate? The reason why the answer to this question must be established is that if the effects of the orthography are to be monitored it must first be known exactly what the phonology is like prior to any changes. Through establishing the composition of the phonology prior to literacy in various age groups, the effects of literacy on the phonology can be comprehensively accounted for. Furthermore, examination of the phonological abilities of both adults and children may remove the possibility that natural cognitive maturation is responsible for the changes in the phonological system. In the pursuit of this issue this section examines pre- and early literacy in order to construct a profile of the 'phonology' of these stages.[2] This profile will be used in an examination of the phonological processes the speaker can manipulate at various stages of literacy acquisition. If this approach is used, the changes in the profile of the phonology can be viewed at each stage of literacy attainment.

Work on pre-literacy and the process of learning to read has steadily increased since the 1960s. The motivation for these studies was to ascertain how reading and spelling should best be taught, although for construction of a pre-literate profile the information is just as valuable. The studies on phonological abilities all follow a similar pattern: subjects' abilities to manipulate levels of the phonology are tested to ascertain what phonological processes and information are available to the speaker at

[1] The term Pre-literate is used in this thesis for both pre-literate children (children not yet old enough to read) and illiterate adults, as both groups can potentially learn to read and write.

[2] It should be pointed out at this stage that the data available from studies testing totally pre-literate individuals is limited. As a result of this much of the data is from early literacy studies.

a given point. The performance (or in many cases the lack of performance) of the subjects in executing tasks at a conscious level gives an insight into the competence of the speaker, i.e. it would be expected that if the person is able to perform a given task they will do so.

Bloomfield (1933: 78) gives an account of how a speaker would establish, by a process of substitution, the number of phonemes contained in a given word (Bloomfield's example is *pin*). The logic behind the process cannot be faulted, i.e. it seems that this must be the way our brain ascertains what is a phoneme and what is not. His explanation of how phonemes can be divined is this:

> A moderate amount of experimenting will show that the significant features of speech-form are limited in number. In this respect, the significant features contrast with the gross acoustic features, which, as we have seen, form a continuous whole and can be subdivided into any desired number of parts. In order to recognise the distinctive features of forms in our own language, we need only determine which features of sound are 'different' for purposes of communication. Suppose, for instance, that we start with the word *pin*: a few experiments in saying words out loud soon reveal the following resemblances and differences:
>
> (1) *pin* ends with the same sound as *fin, sin, tin*, but begins differently; this kind of resemblance is familiar to us because of our tradition of using end-rime in verse;
> (2) *pin* contains the sound *in*, but adds something to the beginning;
> (3) *pin* ends with the same sound as *man, sun, hen*, but the resemblance is smaller than in (1) and (2);
> (4) *pin* begins with the same sound as *pig, pill, pit*, but ends differently;
> (5) *pin* begins with the same sound as *pat, push, peg*, but the resemblance is smaller than in (4);
> (6) *pin* begins and ends like *pen, pan, pun*, but the middle part is different;
> (7) *pin* begins and ends differently from *dig, fish, mill*, but the middle part is the same.

These seven steps allow a person to establish the three 'minimum units of distinctive sound features', the phonemes, of the word *pin*. There is only one problem with this analysis: Bloomfield has not considered that in this exercise he uses either hindsight

(or knowledge) only available to the literate speaker. For the pre-literate speaker the process of elimination would not reveal the basic units for the simple reason that a prerequisite for the elimination process itself is an understanding that the word has a certain number of phonemes at the outset, i.e. it is not an automatic realisation for every speaker that <-in>, <-ig> and <-it>, for example, share the same /ɪ/ phoneme.[3] It will be established in the following sections that this is information available to the literate speaker which is obscure to the non-literate. As such, certain of the steps proposed by Bloomfield are impossible for non-literate speakers. This chapter will show that the very mechanism being utilised by Bloomfield is a by-product of literacy, with the ability to perform this task (phoneme comparison and substitution) limited to literate speakers only. In other words, segmental phonological abilities are not automatically-attained abilities. This position seems to contradict the obvious first impression of a pre-literate child, which leads us to surmise that a child has a fully functional ability to manipulate utterances at a phonemic level simply because they appear to do this in simple tasks such as distinguishing the words *cat* and *hat*. On first inspection, this task appears to require knowledge of the phonemes /k/ and /h/, however, in the following discussion it becomes apparent that for the pre-literate this is not performance of a phoneme comparison analysis, but rather involves awareness of onsets and rhymes. The following discussion will establish the inextricable link between the sub-syllable sized units and the process of learning to read.

2.1 Pre-Literacy.

As was stated above, the methods used to establish what information is available to the pre-literate follow a fairly standard procedure. The testing method involves analysis of specific levels of the phonology, i.e. syllables, onsets, rhymes, phonemes,

[3] The pre-literate treats each of these three combinations as single units, so any sub-regularity, like all including /ɪ/, is not observed.

with the subject required to manipulate the specific phonological areas if they are to successfully complete the task. A subject's ability to complete a given task highlights what information the person has available to them.[4] If a speaker cannot perform a task which involves access to the phonemic level, for example, it can be surmised that the subject does not have the information available to perform the task; it is not merely a case of not accessing the information: the information simply is not there. The relevant comparison in all of the tests which will be discussed is the fact that a normal literate adult speaker can perform all of the tests, which points to the conclusion that literacy is heavily linked to a person's ability to manipulate the sub-syllabic units and, even more fundamentally, to the person having the sub-syllabic units at all.

2.2.1 The Syllable.

It has been shown that a pre-literate child is aware of syllables prior to any awareness of phonemes (Liberman *et al.* (1974), Fox and Routh (1975), Hardy, Stennett and Smythe (1973), Treiman and Baron (1981)). The syllable seems to be a naturally acquired phonological unit, with a speaker able to count the number of syllables in a word from an early age. Based on this fact, Griffen (1985: 10) takes an extreme position which presupposes that the syllable is in fact the primary unit within the phonology: 'the segmental input to the speech string is governed primarily by rules which act upon syllable sized units'. This may indeed be the case for the pre-literate prior to their awareness of alliteration and rhyme because at this stage any processes *must* by default apply to syllable sized units as no other phonological unit is available (see below). Also for the illiterate adult a system such as this must by default be applied as no alternative system is available. Surely, however, this is not the way the

[4] Working on the 'Principle of Least Effort' which dictates (quite logically) that if we have a tool at our disposal which could be used for a given job and a job arose where the tool could be used, we would use the tool (Zipf (1949)). As this is seen as a general tendency for humans, the same principle can be applied to linguistic information/tools available to a speaker.

literate adult speech functions. The reason lies in the fact that the number of possible syllables in the English language runs into several thousand (Harris and Coltheart (1986)) each of which would have to be learned along with any relevant rules which could be applied to them (limitation rules such as where the syllable could appear, how it would be stressed, etc.). The functional load and lack of economy of such a system is extreme for the adult speaker (although evidently workable as illiterate adults and non-literate cultures surely show). When this is compared with a system which is based on the phoneme as the minimal unit, however, it becomes apparent that massive savings in inventory can be achieved (around forty units compared to several thousand[5]). It seems logical that the more economical system would prevail when the speaker is faced with a choice of basic unit on literacy development. The obvious hindrance for the non-literate speaker developing a more economic solution is that the system only develops as a result of learning to read. The syllable, on the other hand, appears to be a naturally acquired unit of the pre-literate phonology. But it is not the syllable that is of interest in a study of literacy development, because the non-literate has access to syllables, rather it is the internal structure of the syllable which is of relevance. This is where the fundamental difference between the literate and the pre-literate lies.

2.2.2 Intrasyllabic Units.

The intrasyllabic units are the internal units of the syllable: the onset, rhyme, peak, coda and the phoneme. As was stated earlier, it first appears that children have access to phonemic information through their ability to distinguish words such as *cat* and *hat*. In studies which have been undertaken with pre-literate children this supposition is examined in operations which test the child's abilities to carry out phonological segmentation tasks. Phonological segmentation involves understanding that words

[5] Although considering Ladefoged's remarks in the previous chapter this saving is possibly quite irrelevant.

are made up of smaller indivisible units (phonemes), and the ability to manipulate these segments, i.e. add, remove, transpose them, etc. If a speaker does not have this understanding they *cannot* perform the task as the units do not exist for that speaker and as such are not manipulable. So a speaker who has this ability would be able to analyse a word such as *pin* into three phonemes (/p/, /ɪ/ and /n/) then add or remove phonemes to the word on request. The usual method used to ascertain a child's capacity to do this is to present them with aurally given test words then to ask them to add or delete a given 'sound'. The performance of the child while doing the task is therefore a gauge of their awareness of the specific number of sounds (phonemes) in a word.

Bruce (1964) examines children between the ages of 5 and 9 to ascertain the phonological ability of the subjects. In the tests the children were asked what a word such as *sand* would sound like without the sound 'n', i.e. /sad/.[6] The results show that the children at 5 years old could not perform this task at all. In fact, all of the children in the early stages of literacy found the task extremely difficult. On the basis of these results, Bruce defines four 'problems' that a child must overcome to become a proficient reader and to have a fully developed phonology which would allow a

[6] The object of Bruce's study was purely to check phonological awareness in the subjects. However, the testing was not done in the visual mode yet the study crucially depends on the influence of the spelling as a segmentation means, although this is far from explicitly stated or seen as particularly relevant. Worth noting here, in case it has any relevance to the results of the study, is that all the test words became another word when one sound was removed, *but only from an orthographic perspective*, i.e. when a letter from the spelling was removed. One of the examples in the test was for the subject to remove the sound 'k' from *monkey*. Presumably the response was meant to be *money*, but from a phonemic perspective the fact that the /k/ has caused the nasal to be velarised is irrelevant, which means the correct response is /mʌŋɪ/ based on only the /k/ being removed (a difficult non-word by a child's standards). In order to give the correct response the analysis would need to work at the orthographic level: the letter corresponding to the sound would have to be removed and then the orthographic string reconverted to phonological information. The result of this orthographic analysis would give an unvelarised nasal /n/, allowing the *money* form to be produced. Bruce does not seem to realise that the extremely complex and orthography intensive nature of this task may well be the reason the 5 years olds could not perform the task. To put it simply: although this is a pure phonological deletion task, some of the target answers, which appear to have been selected as they are other words in the language (which will aid the test subjects), are only available to the speaker through orthographic analysis. So the task is not quite the simple phonological deletion task it is intended to be. If Bruce has mentioned orthography this would all be irrelevant, but as he does not, this problem perhaps explains some of the results.

process such as that just outlined to be completed correctly. All of the tested readers fell into one of the four problem stages, only advancing to the next stage when the problem from their current stage was overcome.

The first problem/stage Bruce posits is that a speaker must recognise that words and sounds are inter-related. The second problem/stage is understanding the nature of the task that is being tested. Various responses showed that the task itself was not fully understood by the children, with responses which included the child repeating the test word as their answer, e.g. *what would 'hand' sound like without the 'n' sound?* The child's response was 'hand'. Another response (by far the most common) was to give a word which started with the sound which was required to be removed, e.g. *What does 'monkey' sound like without the 'k' sound?* The child's response was 'Kent'. These sort of responses highlight the lack of comprehension the children had for the task. The incomprehensibility of the task comes from the fact that the child is being asked to manipulate information that is not available to them, i.e. this task involves manipulation of phonemes, but phonemes do not yet figure in the child's phonology (see below). The third of Bruce's problem/stages is to acquire the understanding that the same phoneme can occur in different parts of the syllable, e.g. that /p/ can appear in either the onset or the rhyme and as part of a cluster in either of these positions. Finally, a speaker must see beyond the cohesiveness of the word's sound pattern, i.e. the speaker must be able to analyse the non-discrete string (a word) into its phonemes. These are logical obstacles for the new literate to overcome, but this is less relevant than one recurrent factor at this early stage of literacy. Of greatest interest in Bruce's study is that removal of the first phoneme from a word (the onset) was by far the easiest task for all groups. The responses from the children who used the test sound as an onset for their response sheds some light on why this is the case and also shows what information is most natural and most easily available to the child at this point. For example, if children are given the test

word *monkey* and are asked to remove the segment /k/, then responds with *Kent,* what are they doing? They are taking the single consonant phoneme given and putting it in the only position a single consonant phoneme can occupy: the syllable onset;[7] with the response word tending to be any word which has /k/ as an onset from the child's own vocabulary. This is because in the early stages of literacy the only intrasyllabic units a child appears to have access to are onsets and rhymes, as is borne out by the subjects' better ability to segment at the boundary between onset and rhyme. It seems that they gain access to this intrasyllabic level if, *prior* to any reading teaching, they have been exposed to alliteration and rhyme (Bryant (1996)). The stimulation of the child in these pre-literate years through alliteration and rhyme games causes the child to make the connection at some level that there is an onset and a rhyme within a syllable, but again this is not a naturally occurring process and does not occur without the stimulation of games or rhymes. This is evident in the different approaches and results used by Treiman and Zukowski (1991) and Calfee *et al.* (1972)). Both of these studies examine the ability of young children to understand rhyme. Treiman and Zukowski used a puppet in an interactive game to elicit their responses from the children, while Calfee *et al* used more conventional testing methods. The results show the puppet show, the more stimulating environment for the child, elicited more responses. In other words the child has to be motivated to learn and use onset/rhyme division: it will not occur by default.[8] Returning to Bruce (1964) it can be seen that the onset is the only place where a single phoneme corresponds to an intrasyllabic level. A consonant phoneme in a rhyme is always part of a complex rhyme if there is access only to the rhyme level of the syllable (as nuclei are compulsory within a syllable), whereas a consonant phoneme can appear as a

[7] This may seem overstated, however there is no other place in a syllable where a consonant makes up the whole intrasyllabic unit, peak and coda not yet being available to the child, and syllabic consonants corresponding to the higher level of syllable. The onset is the only place in which C = intermediate level syllabic unit (onset).

[8] See section 2.2.4 below.

simplex onset. The propensity for the children to produce a response with the test sound as an onset is accounted for through this, along with the ease of initial phoneme removal. The relevance of this appears to have escaped Bruce, yet it is of crucial importance if pre-/early literacy phonology is to be understood. It highlights the levels of intrasyllabic awareness a child has at the earliest stages of reading, highlighting that the progression towards full phonological development follows a path which employs finer and finer levels of detail: syllable → onset/rhyme division (and as will be shown below → phoneme level including peak/coda division).

The study of intrasyllabic units undertaken by Treiman (1992) is a far more comprehensive account of the status of early literate phonology. Treiman has examined the teaching of reading and has challenged the assumption that a child moves from syllable comprehension to phoneme comprehension at a leap. What is posited instead is the importance of intrasyllabic units between these two stages in the literacy process. Cited in the account is Treiman (1986), which establishes the position where a speaker will naturally break a word to produce a blend with another word. Treiman tested various age groups to establish what is the dominant-sized intrasyllabic unit at a given point in a person's move towards literacy. College students were tested to establish where words of CVCC segments would be split if a blend of two such words were to be produced. The new word was to be comprised of the first part of the first word and the second part of the second, i.e. /pakt/ *packed* and /nʌts/ *nuts* can combine to yield /pʌts/ *putts*, /pats/ *pats*, or /paks/ *packs*. The responses are analysed on the basis of where the division occurs in the production of these new blends, i.e. *putts* is a C/VCC split produced from the initial consonant of the first word and the second word minus its initial consonant. In other words this division is a removal of the onset with the blend made with the rhyme of the second word. *Putts* CV/CC involves a split within the rhyme (nucleus/coda) and *packs* CVC/C also involves a split within the rhyme (within the coda). The results show a

tendency (over 90%) to break the words at the onset position, i.e. transposition of the onsets of each of the words. This was further tested to see if only the first phoneme was being removed. Input words of the form CCVC were used, i.e. /frel/ *frail* plus /slat/ *slat* give rise to the possible forms /flat/, /frat/ or /fret/. The results again show the preference to transpose the whole onset. The same tendency also occurs with three initial consonants CCCV. This shows that the preferred position to break the syllable is at the level of onset and rhyme. This is perhaps further reinforced by the spoonerism speech errors noted by Shattuck-Hufnagel (1983) where onsets from following syllables are transposed in speech as onsets from later words are anticipated. But is this the same for children?

Treiman (1992) cites two papers which show that there is a cognitive maturation age which must be reached before the child has the ability to perform tasks involving onsets and rhymes. Lenel and Cantor (1981) examined 4-year-old children in a forced choice rhyme task.[9] The results showed an above-chance success rate, i.e. the children knew which word rhymed with the test word in most cases. In a similar study involving 3-year-olds, MacLean *et al.* (1987) found that children of this age were not aware of rhymes. This shows there has to be a minimal level of cognitive maturation which must be reached before the first level of intrasyllabic units (onsets and rhymes) can be ascertained and it appears to be reached at around 4 years old. From this age on though, the ability to manipulate and comprehend rhymes increases steadily to full literate level (and maintains a dominant position as an intrasyllabic unit as Treiman's study of the college students shows.) The ability to delete the onset is also a method of establishing if a child has control of onsets and rhymes as units, although phonological deletion tasks are the most difficult to do (Yopp 1988). But the studies by Calfee *et al.* (1972) and Stanovich *et al.* (1984) show that children can manipulate onsets and rhymes to an extent that allows the

[9] Forced choice involves giving a test word, e.g. *bed*, then asking if it rhymes with one of two other words given, e.g. *sled* and *ring*.

deletion of onsets. The conclusion to be drawn from this is that the onset and rhyme can be pre-literate phonological units for the speaker prior to any encounter with literacy.[10] Also they maintain a dominant position as units within the phonology even for fully literate speakers.

The next syllabic sub-levels are the peak and coda within the rhyme. The status of these intrasyllabic units does not appear to be as psychologically real as the onset and rhyme, or as phonemes themselves, perhaps because of necessary closeness between peak and coda and the phonemes which constitute them. Treiman (1985) examines the ability of children (aged 8) to substitute phonemes in a syllable CVC through two tests. In one test the first and second phonemes were to be replaced by a fixed pair of phonemes, e.g. the /fɛ/ of /fɛg/ was to be replaced by /lʌ/ to give /lʌg/; and in the second test the second and third phonemes were to be replaced with a fixed pair of phonemes, e.g. the /ɛg/ from /fɛg/ was to be replaced by /ʌl/ to give /fʌl/. The prediction was that the first test would be a more difficult operation as it involves breaking the rhyme into phonemes, where the second test involves only transposition of the onset onto the fixed rhyme. The results were as would be expected with the children performing best at the second task. The individual phonemic segments of the rhyme seem to be required to establish how a rhyme should be broken; an operation a speaker becomes more competent with as literacy attainment continues. The status of these units though does not seem to be as psychologically 'real' as the status of onsets and rhymes. In Treiman (1992) there is an examination of spelling errors made by children specifically involving the rhyme. Children have a tendency to use letter names, e.g. <r> is /ar/, in spellings; a method which removes the need to analyse the rhyme into peak and coda. For example, a child in the study spelled the word *farm* as <frm> using the phoneme for the first and

[10] It should be noted that although children can do this prior to learning to read again it is not automatic. A child who is not stimulated to play with words and read rhymes will have less chance of establishing what is an onset and what is a rhyme. The relevant point to this thesis though is that the child can become aware of these units prior to reading, i.e. it is not a by-product of reading.

last sound and the letter name for the <r>. The reason for this is that the child is utilising the sound of the letter name (/ar/) to form a unitary part of the rhyme, through use of the letter name, which allows the child to achieve (in part) their natural tendency to want to treat the peak and coda (the rhyme) as a single unit. The overall form of the spelling indicates a lack of real understanding of the rhyme composition.[11] This erroneous method of early spelling has also been observed and documented by Ehri (1986). Treiman (1992) does give some inconclusive evidence that certain letters are more prone to this letter name use than others, but the results do not easily categorise the letters into groups that do act in this way and those that do not. This would perhaps suggest that peak/coda division occurs only as a result of the presence of vowel graphs, but, experiments which force an adult speaker to break the rhyme show tendencies for some consonantal elements also to be associated with the peak, i.e. liquids and nasals.[12] That these elements are associated with the peak removes the possibility that vowel graphs define the peak, with the rest of the syllable to the right being the coda. The phonological relevance of the peak and coda may be what makes this less real for an early speaker (and perhaps even for the adult speaker) in that although stress is associated with nuclei, the stress could equally well apply to rhyme units or even syllables. The status of these intrasyllabic units does not appear to be as clear-cut, or as natural, as the onset and rhyme units. The reason for this is likely to be that the relevance of the peak/coda distinction is not as relevant as onset, rhyme or phoneme, which perhaps explains the lack of psychological reality that the above examples suggest.

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[11] See next footnote regarding the possibility that the reason for this is because /r/ is a liquid which can be misinterpreted as a part of the nucleus.

[12] Fudge (1969) and Selkirk (1982) are of the opinion that nasals can also be part of the peak of a syllable according to Treiman. Experiments by Treiman (1984) involved subjects producing blends from two test words with syllable shape VCC. Both liquids and nasals were tested. Treiman's results corroborate the conclusions of the other papers with regard to liquids, however there was no evidence in the experiment that nasals were associated with the peak in the same way.

The next and lowest (or most detailed) level of the syllable is the phonemic level. The studies suggest that this level occurs prior to or simultaneously with the peak/coda division, i.e. the peak and coda come into existence only when the speaker becomes phonemically aware, at which point judgements on the segments involved in the rhyme becomes more transparent. The justification for this order is that 8-year-old children understand phonemes, yet still have difficulty with the break-up of the rhyme into peak and coda (Treiman (1985)). Logically, the phoneme should come first as this would allow the use of phonological information in both the division of the rhyme and decomposition of complex onsets and codas. The process from the other direction is not as logical, i.e. why would a child need to know that /a/ is the peak and /rm/ is the coda of <farm>? The rhyme is relevant for rhyming purposes and the onset for alliteration, but the peak and coda do not appear to be such linguistically relevant units.

2.2.3 The Phoneme.

As discussed in section 1.5, Ehri (1984) examines the nature of alphabetic information as it pertains to phonemic awareness and segmental abilities, using carefully screened pre-literate subjects. As the earlier section covers this study in detail, only the relevant aspects will be reiterated here. The subjects were divided into three groups, two groups of which were taught phonological segmentation (one group with Letter tokens and one with Ear tokens). The third group was not taught (as a control group, to establish whether the ability would spontaneously develop). The purpose of the study was to establish whether alphabetical letters had any effect on learning phoneme segmentation - in that each letter or combination of letters can represents a sound. The supposition was that the children who were taught to segment using the Letter tokens as 'mediators to distinguish and conceptualise' the sound segments would be more successful in phonological tasks than the children

with the Ear tokens, with both groups being more successful than the group with no tokens. The results confirm this supposition as section 1.5 shows. The study highlights various points of interest, the most notable points being that segmentation could be taught with or without writing, and that alphabetical letters reduced rogue sound intrusion in words. The conclusion that can then be drawn from this is that alphabetical letters seem to bring together sounds and associate them with specific graphs (or groups of graphs). This information would seem, therefore, to be the logical source for the development of the phonemic level for the speaker as a specific letter becomes associated with the possible phonetic realisations of a given phoneme. This allows the individual segments to be manipulated as they are no longer word specific (cf. Bruce (1964) above).

What is the relevance of this? Ultimately it must be concluded that as English utilises an alphabetic writing system that this is the most likely source of the development of the phonemic level. The fact that phonological segmentation can be taught without the alphabet is irrelevant as the alphabet will be by far the most likely source for the construction of the phonemic level simply because it is there. To state this more strongly, segmental phonology appears to be a by-product of literacy attainment in languages which utilise an alphabetic writing system.[13]

2.2.4 Illiterate Adults.

At the beginning of this section the concept of general cognitive maturation was mentioned. In order to ensure that the phoneme development is not the result of a person's brain function development it must be shown that illiterate adults have no

[13] An interesting study was undertaken by Mann (1986) which compared the phonological development of 6 year old American children and 6 year old Japanese children. The American children were obviously taught using the alphabet where the Japanese were learning a syllabary and an ideographic system. In a syllable judgement task (tapping out the number of syllables in a word) both groups performed to the same levels. In a task involving phoneme removal though, the American children performed better than the Japanese. This study reinforces the crucial nature of the alphabetical system for phoneme development.

access to the phonemic level. It was shown above that there is a minimal cognitive level which must be achieved for children to comprehend onsets and rhymes (around 4 years old). There is also a minimum cognitive age for phoneme awareness according to Bruce (1964), which is around the age of 7 years. If literacy does not influence the development of a speaker's phonology then an adult who cannot read should have access to phonemes for the simple reason that, assuming they are normal adults, they will have a mental age greater than 7. Morais *et al.* (1979) explores this issue with Portuguese illiterate adults and literate adults from similar backgrounds and upbringing. The subjects were given similar segmental manipulation tasks to those outlined above. The results of this study show that illiterate adults cannot perform phoneme segmentation tasks where literate adults can. This difference in phonological manipulation ability between the literate and illiterate adult removes the possibility that the intrasyllabic unit development is the result of cognitive maturation. Literacy therefore seems to be the driving force behind the construction of the lower level syllable-internal phonology.

2.3.0 Reasons for Phonological System Development.

There seems little doubt, based on the available evidence, that literacy is the trigger for the construction of the phonemic level and that the status of the pre-literate phonology remains undeveloped to adulthood in the absence of literacy. Even considering Ehri's (1984) study, which shows that phoneme segmentation can be taught without alphabetical characters, it is doubtless the case that alphabetical characters are the source of phonemic-level development because exposure to written language is the normal way a speaker is likely to encounter the need for segmental phonological units, i.e. there is no requirement for a speaker to have the phonemic level if they do not read, except purely to participate in linguistic studies as phoneme aware non-literates. The need for phonemes appears to be required (and constructed)

purely for the systematisation of the orthographic data in the literate speaker. Another possible motivation for the change can also be seen as relevant.

Obviously, the non-literate speaker has a fully functional spoken language ability regardless of their inability to read as was briefly discussed in section 2.2.1 above.[14] Obviously their phonological system, albeit more limited, is adequate, which leads to the relevant question: why does the phonology change so fundamentally? The greater economy and generality of a phonological system as opposed to a system which is based on onset and rhyme sized units is the likely motivation. Consider the following list of words from the phonological perspective:[15]

<kit>	kɪt	tɪk	<tick>
<cot>	kɔt	tɔk	<tock>
<cat>	kat	tak	<tack>
<Kate>	ket	tek	<take>
<cut>	kʌt	tʌk	<tuck>
<coot>	kut	tuk	<took>

A system based on intrasyllabic units (onsets and rhymes) requires a segment inventory for this list of words comprised of 14 'segments': onsets: /k, t/ and rhymes: /ɪt, ʌt, ʌk, ut, uk, ɪk, ɔt, ɔk, at, ak, et/ and /ek/.[16] Comparison of this with a phonemic system based on the same list of words highlights the obvious saving in

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[14] There are obvious morphological limitations, although there is no reason why the illiterate speaker could not merely learn all of the possible alternants. See Chapter 3 on the necessity of orthographic information for correct vowel production.

[15] This list is made up by reversing first and last phonemes around common vowels. The resultant words must be English words, which is why examples such as *tech~*ket* is not included. The words must be real words to highlight the real inventory as opposed to a theoretical set.

[16] As these are not phoneme combinations but rather minimal units for the pre-literate I have chosen to use underlining to show the unanalysed rhymes. The relevant part of a syllable tree would obviously be

where the triangle does not only represent that the rhyme is not analysed, but more than this that it *cannot* be analysed any further (the exclamation mark). Any underlined phoneme combinations will follow this pattern.

economy: only 8 phonemes are required (/k, t, ɪ, ɔ, a, e, ʌ, u/). There is also the aspect of generality of the phonemes over a greater number of words, which is an obvious benefit for a phonological inventory. A system based on phonological units is the logical direction for a speaker to move as it is the most general and economical solution, with the greatest versatility. It is by no means the first solution the new literate tries though. There are many other possible solutions explored before this solution is developed.

2.3.1 Bloomfield Revisited.

Before examination of the process of learning to read this seems to be an appropriate point to return to Bloomfield's elimination process. It should now be evident why the non-literate speaker would have problems with such a process. It has been shown that the pre-literate speaker has access only to the onset and rhyme at best. The construction of the rhyme is therefore opaque for such a speaker. So how far could the non-literate speaker analyse *pin* following Bloomfield's steps?

> (1) *pin* ends with the same sound as *fin, sin, tin*, but begins differently; this kind of resemblance is familiar to us because of our tradition of using end-rime in verse;
> (2) *pin* contains the sound *in*, but adds something to the beginning;
> (3) **not available.**
> (4) *pin* begins with the same sound as *pig, pill, pit*, but ends differently;
> (5) **doubtful but possible availability.**
> (6) **not available.**
> (7) **not available.**

Only those elimination rules specific to onset/rhyme division would be ascertainable for a non-literate speaker as there is no knowledge of the internal construction of the rhyme. Any step which notes the differences in construction of the rhyme must therefor apply for such a speaker to the whole rhyme level and not to the segmental level. As such this phoneme ascertainment process from Bloomfield can be seen as

available only to the literate speaker, as only the literate can perform the missing stages and as such can ascertain that *pin* has three, and only, three phonemes. A non-literate speaker through the steps they can apply would conclude that in fact it had two indivisible units: /p/ and /ɪn/. If Bloomfield's stage (4) is considered in greater detail the fundamental difference in literate and non-literate phonology is clear:

(4) *pin* begins with the same sound as *pig, pill, pit*, but ends differently

Utilising a similar analysis to that in 2.3.0 above, we see that these four words have 6 phonemes between them /p, ɪ, n, g, l, t/ and that all of the words share the same first two phonemes/pɪ/. For the non-literate though the same four words are comprised of 5 intrasyllabic units (onset /p/ and rhymes /ɪn, ɪg, ɪl, ɪt/) and that all of the words share the first intrasyllabic unit /p/. The intrasyllabic set has fewer items in its inventory (for this limited set of words), yet only the phonemic system truly captures the similarity of the words.

2.4.0 Learning to Read.

When a speaker is first confronted with written language a system must be developed for storage and recall of the new information. In this section the various stages passed through by a speaker learning to read are examined. When a speaker is learning to read they try out various methods of dealing with the new visual information. Each of these systems is employed until at some level the new reader realises that the system is not economical enough. At this point the system is abandoned in favour of an alternative solution. This section examines the reading process from pre-literacy to a stage where the system the adult utilises has been developed.

Harris and Coltheart (1986) examine the process of learning to read, dividing the process into stages at which different methods of reading are employed by the new reader. Two possible ways in which a child may be dealing with the early stages

of reading are first discussed. The first method is the 'direct procedure' (or 'whole word recognition' procedure). The 'direct procedure' method of reading is one in which a correlation has been made by the child between a certain string of letters and a spoken word, i.e. the correspondence between <cat> and the spoken utterance that is *cat*[17]. This method of reading will allow access only to the words the child knows how to 'read', i.e. the child has no way to extend the reading ability to other words using such a system as the written form is like an ideograph at this stage: an arbitrary picture for the spoken word it pertains to (although it is not quite this abstract, as will be explained below). The greatest problem with such a system, as Harris and Coltheart point out, is that it would not allow the reader who knew how to 'read' the words *cat* and *hot* to also read the word *hat* or *cot* which share a great similarity.

The second method of reading Harris and Coltheart postulate is that the child may be reading using the 'phonics procedure'. This procedure involves the child reading the word via spelling-to-sound correspondences, i.e. <c>, <a> and <t> represent /k/, /a/, /t/ at some level to give the spoken form for *cat*. This is a far more beneficial route for the new reader to go as all newly encountered words will at the very least give some kind of pronunciation (a Spelling Pronunciation), cf. *cat*, *hot*, *hat* and *cot* within this system. The detrimental side of the system though is that sounds are spliced to others in the earliest stages of this kind of reading, i.e. <cat> is not /k/, /a/ /t/ but rather /kə/, /a/, /tə/. This means for the child learning the sound/spelling correspondences there is an added complication: learning the process of recognising the relevant part of the semi-phonetic letter names and deleting the rest before splicing these new elements together. As was explained above, this onset/rhyme division is within the capacity of most pre-literates, which is why this seemingly abstract analysis is resolvable by the early literate. The benefit of the use of sound/spelling correspondences in utilising the 'phonics procedure' is that it is

[17] Note that it is the phonetic string as a whole that is linked to the orthographic string, rather than the phonological make-up of the word.

'parasitic' on the speech system, i.e. the speech system, which is more developed at this stage than the reading system, is being tapped by the reading system through the intermediate stage of spelling-to-sound conversion rules. This is obviously a more useful approach as what is already know is drawn into the new written information, whereas the 'direct procedure' is a stand-alone system - no relationship is formed between the pre-existing speech and the letters which make up a word.

What Harris and Coltheart try to establish is which of the above methods is being utilised by the child reader at a given point. In the pursuit of this goal, they document a complex transition from pre-literacy to literacy. The evolution is defined in the following four stages:

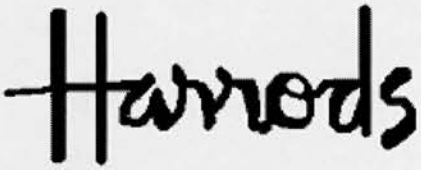
- the 'sight vocabulary' phase
- the 'discrimination-net' phase
- the 'phonological-recoding' phase
- the 'orthographic' phase.

2.4.1 The Sight Vocabulary Phase.

The 'sight vocabulary' phase utilises the 'direct procedure' as a means of sight-reading a small set of words. Fowler (1962) documents a study which shows that vocabulary sets of this kind can run into hundreds of words and that a child as young as two can achieve this number of sight vocabulary items. One of the issues pertinent to this stage of reading is how the child is taking in the visual information, i.e. is it taken in as if the whole is a picture, or is it taken in as a string of letters (probably each individual letter being nothing more than a picture at this stage)?

Harris and Coltheart (1986: 87-90) tested a four year old child (Alice) to examine the nature of her reading in order to establish what information she was processing to read the words in her sight vocabulary. Alice was in the sight vocabulary stage when the studies were carried out and had a reading vocabulary of

around thirty words, some of which she had been taught (her name, her parent's names), and others which she had 'picked up' herself. One of these untaught words was 'Harrods' (the shop). Alice could read 'Harrods' whenever it was presented: shopping bags, bus advertisements, etc. The question was: was it the logo shape that was being 'read' or were the letters of relevance. The usual format of the word was obviously the logo:



To ascertain the way Alice was reading the word the visual format of the word was altered to the following:

hArRoDs

This format of the word was one which Alice had not seen before, yet without hesitation she read the word correctly. The experiment was repeated with 'Fiat' (another of her 'picked up' words). The original format being:

The modified format given again alternated between upper and lower case giving:

fIaT

Again the word was correctly read.

But did the child have the ability to extrapolate from this to give other words made up from the letters she has in her reading vocabulary? Harris and Coltheart (1986: 88) tested this also and found that 'unfamiliar words and non-words could not be read aloud at all'. Also checked was the possibility that one or certain of the letters

in a word were working as cues for Alice's reading. This was tested using the name 'Max' which she knew. The word was presented in the form <mAx>, and as expected the word was read correctly. The following was then presented with the task being to correctly point out 'Max':

mAx
rAx
mOx
mAv

'Max' was correctly pointed out which shows that presence of all of the letters is a prerequisite to read the word, i.e. fragmentary cues are not utilised for reading at this stage of reading development.

So what does this say about the sight vocabulary phase? It shows that for Alice, words are not taken in as whole visual constructs but rather that there is an awareness of the sequence of letters. Moreover, the experiments show that there is no evidence of any link between the letters and the sounds they are representing at this stage of learning to read (as is borne out by the inability to read new words). In summary the sight vocabulary phase allows reading of words at a level which uses graphemic information to identify a word, but as yet there is no correlation for the reader between the graphs and the sounds they represent (no transferability). As a method of reading it therefore is eventually abandoned as each word is learned (or recognised in some capacity) rather than read in the true sense of the word. Obviously the new speaker is subconsciously aware that this is not an economical solution as their vocabulary increases which causes them to evoke a new method of reading.

2.4.2 The Discrimination-Net Phase.

The second phase a child learning to read passes through is the 'discrimination-net phase' (Harris and Coltheart (1986: 90-92)). This strangely labelled phase involves

the new reader doing exactly the opposite of what was discussed above: the reading process at this stage *does* involve 'fragmentary cues' of the type just dismissed with the 'Max' example. Various studies undertaken point to the new reader utilising small parts of visual information for word identification. Seymour and Elder (1985) examine children, aged 5-6 years old, at this stage in the reading process. Their paper outlines the sort of diverse cues the child uses to 'read':

WORD(S) PRESENTED	WHAT THE CHILD READ	WHY THEY MADE THAT JUDGEMENT
<television>	'children'	'children' is a long word
<smaller>	'yellow'	'It's 'yellow' because it has two sticks'.
<likes>, <bkacl>, <pjoek>	'black'	word contained <k>

The responses highlight some of the features the child looks for in a word: word length, presence of a given letter (i.e. <k>) and double letters, etc. The whole string of letters no longer seems relevant to the reader at this stage of reading development, although what exactly is gained by the move to the new method is difficult to ascertain.

Another feature of this stage of reading is that the child will try to respond to a visually presented word using the words they have had in reading classes as their source of possible responses (Seymour and Elder (1985)). Similarity between any of the words in their reading classes and the word presented will dominate the response. This process of finding some unique feature from each of their reading words would seem to be fraught with problems; but, when the children were presented with words and asked if they knew the presented word from their reading classes the results were far more accurate than would be expected. 50% of the list of words presented were words which had been included in the reading classes, the other 50% had not. Of the words presented, the children correctly identified words they had been taught to read 90% of the time, i.e. the children knew which words they had been taught and which

words they had not, based on visual clues alone (Seymour and Elder (1985)). Considering the examples above this seems incredible yet this is what the results reflect.

Further tests were undertaken by Seymour and Elder (1985) to establish whether distortion of the visual information would affect the child's ability to read the word. To test this hypothesis the words were presented in normal, zigzag and vertical forms, i.e.

yellow	y l o e l w	y e l l o w
NORMAL	ZIGZAG	VERTICAL

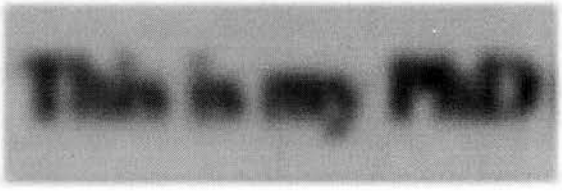
The results showed reading accuracy for each type of presentation as follows:

Normal	66.3%
Zig Zag	60.4%
Vertical	49.7%

The overall accuracy regardless of the formats shows the child looks only for the salient feature of the word that they want to read. If the whole of the word were relevant then this sort of manipulation of its visual form would show greater results (although it does appear that vertical presentation is visually different enough to muddle the visual clues.) So it seems that when the child is reading they compare the salient features of the words they know with the word presented with the result that the most similar word in their vocabulary is selected and 'read'.

This seems to be a step back from the direct procedure employed prior to this stage and as such would seem to go against the logical solutions to problems that I am suggesting are utilised by the speaker. However, the residue of such a system is still evident in the adult reading mechanism. Consider the following image. Can this be 'read'? And if so on what basis? The letter shapes are fundamentally disrupted yet

a literate adult can make a good guess at what it says - if not actually read it. The reading mechanism appears to have retained a minimal identification system for the purely visual side of reading; a system which begins at a level at which <pjoek> can be mistaken for 'black' but which finally allows us to read something like the image below. I would suggest that our ability to read this is in fact a residue from passing through this early phase of learning to read.



2.4.3 The Phonological Recoding Phase.

The method just described has obvious limitations because the system becomes more cumbersome as the child's vocabulary increases. No doubt there would come a point where such a system would be unworkable as the primary reading mechanism. The new reader has to find a new system which is more economical and functional over all the words the child is learning and has learned. The phase moved into is the 'phonological recoding phase' (Harris and Coltheart (1986: 92)). At this point the child first makes the connection between the individual graphs and the sounds they represent. The abandonment of one area of the process (the visual aspect) is evident while a new element is assimilated by the brain (the phonetic aspect). Of great relevance at this stage of literacy is that the visual shape of the word becomes secondary to the sound/spelling correspondences. This is examined by Doctor and Coltheart (1980) through testing of children aged 6 years old.

The experiments carried out by Doctor and Coltheart use sentences which can be divided into two categories: half of the sentences are meaningful sentences, e.g. *I have no time*; the other half are meaningless, e.g. *I have blue time*. Within this second

group of sentences is a further division: half are meaningless in the true sense, e.g. *tell me new he went*; and the other half contain a word which is homophonous with a word which would make the sentence meaningful, e.g. *tell me wear he went*. (For dialects without the /w/~/ʍ/ distinction this sentence is identical to the sentence *tell me where he went* - a meaningful sentence). The object of the exercise for the children was to say whether the presented sentence was meaningful or meaningless. If the phonics procedure outlined at the start of this section was being used then errors in rejecting some of the meaningless sentences would be expected (e.g. *tell me wear he went*) because of the homophonous word's effect on the meaning of the sentence. Greater numbers of errors within this set of sentences would show a dominance of the phonetic over the visual form at this stage of reading, i.e. the sounds produced from sound/spelling rules would override the fact that the spelling of the word marks it as incorrect. Of the other sentences the meaningful sentences should always be accepted and the true meaningless sentences rejected.

The results of Doctor and Coltheart's experiment corroborate this hypothesis with regard to the sentences containing the homophones. The children gave correct responses for only 29% of the sentences which were homophonous with meaningful sentences (*tell me wear he went*), compared to nearly 92% accuracy with the sentences which were non-meaningful (*tell me new he went*). This shows a fundamentally different approach to this stage of reading: the visual information has become secondary to the phonetic information of the word. This is a crucial turning point in the reading process as the relationship between the sound and spelling is ascertained for the first time. The problem the child now faces is how to differentiate homophonous words. Obviously the system *cannot* function fully and correctly using this system either as there is not proper reference to the system which differentiates the homophones: the spelling.

Another study which Harris and Coltheart refer to, which corroborates the use of different methods of reading at different stages, is Firth (1972). Firth examines the usage of the direct procedure and the phonics procedure for children of 8 years of age. The experimentation was carried out in the following way. The group of children were divided into those who were above-average readers and those who were below average readers. The purpose of Firth's study was to establish what it was that made a good reader a good reader, i.e. which of the procedures do good readers of this age employ? First the direct procedure was examined to see whether it was the system employed by the good readers. A test was devised where pseudo-letters were used which were not part of the Roman alphabet, but looked as if they could be. Strings of pseudo-letters were made up and the children were taught to read these strings of pseudo-letters as words of English. If the direct procedure was the reading method employed by the good readers then this should be highlighted by their ability to learn to read the new words better than the poor readers. This is quite an abstract task. However for the child using the direct procedure it is no different to learning any word in the Roman alphabet because all the words being learned are merely arbitrary representations for the child at this stage. Firth's results show no correlation between good use of the direct procedure and above average reading ability. Children who were good at this procedure could belong to either group. This leads to the conclusion that the direct procedure is not being employed by the good readers at age 8.

Firth then examines the child's use of the phonics procedure to see whether this accounts for the child's good reading ability. The test involved the child reading out pronounceable non-words, e.g. *bef, cal*. A child employing the phonics procedure will be able to ascertain the pronunciation from the spelling, where the child who is not proficient in the phonics procedure would not be able to do this task well - if at all. 150 non-words were given to each child. The results for both groups were

extreme. The good readers averaged 131 correctly pronounced words, the bad readers averaged 29 correctly pronounced words. The conclusion from this is that the phonics procedure was being employed by the good readers at age 8 with the sound/spelling correlations forming the basis of their reading method.

Understanding sound/spelling correspondences is a stage a child must learn in order to become a proficient reader. This allows access to the pronunciation of all new written words as Spelling Pronunciations at the very least. The mastery of this stage is crucial also because this is the point the new reader first begins to establish phonemes within their language for the first time.

2.4.4 The Orthographic Phase.

The problem of homophony is just one problem children cannot overcome if they are to stay at the phonological recoding stage. Also problematic is the fact that in English not every word is a Spelling Pronunciation. The new reader advances to a new level at which the orthography has gained a more prominent position in their reading. In Doctor and Coultheart's task involving the meaningful/meaningless sentences the 6 year old children get the pseudo-meaningful sentences wrong over 70% of the time. For the 10 year old child the same task has an error rate of just over 20%. The increasing use of the orthography in the reading process is the reason for this drop in errors as the orthography in effect removes the homophony by introducing an element which differentiates the two words, i.e. they have individual spellings even if the words share the same pronunciation (the Morpheme Spelling Principle). The 10 year old child still uses the phonic method in some capacity as is seen from a comparison of the rejection rate of the true meaningless sentences (98% rejected) against the pseudo-meaningless sentences (80% rejected). The child at this point is still in the process of moving into a position of full orthographic dominance. But this is perhaps to be expected as the child is at a stage of massive expansion of the

vocabulary. At such a time when so many new words are being encountered the use of the phonics procedure is a necessity for the child (even for the adult reader) to have any sort of access to new written vocabulary because the Spelling Pronunciation is our only way to attempt the pronunciation of words we do not know. So even although the orthography and the uniqueness of the spelling is highly relevant to the literate for storage of words with accurate differentiation the intermediate process is necessary for reasons of versatility.

Coltheart (1980) examines the status of the processes which the skilled adult reader uses and concludes that the phonics procedure is not used by the adult reader, because there is no need to work out the phonemes every time we read a new word. Instead the direct procedure is used (for single word level anyway) probably heavily dependent on the Morpheme Spelling Principle. The spelling is more dominant in the literate adult's reading than is the phonology, which is to be expected because once a morpheme's unique spelling has been learned it can be stored and the visual form will act as a trigger for lexical access. The relevance of the Morpheme Spelling Principle is of crucial importance to this final system though (see Chapter 3).

2.5.0 Conclusion.

The purpose of this section was to establish the link between the attainment of literacy and the development of the phonological system. The studies from both the areas of phonological development and learning to read provide evidence which leaves little doubt that literacy is the trigger and source for the development of the internal phonology of the syllable. So far the two areas have been kept distinct in order to keep the information as clear and simple as possible. At this point it is useful to conflate the information from the two sub-sections to see correspondences between the phonological development and the reading stages involved in a normal child's standard progression towards literacy.

Table of Phonological Development and Reading Phases.

<table>
<tr><th>AGE</th><th>READING STAGE</th><th>PHONOLOGICAL OBSTACLES</th><th>PHONOLOGY</th></tr>
<tr><td></td><td>Pre-reading</td><td rowspan="6"></td><td>syllable</td></tr>
<tr><td>2</td><td>Sight Vocabulary</td><td rowspan="2">no rhyme awareness</td></tr>
<tr><td>3</td><td rowspan="2">Direct Procedure</td></tr>
<tr><td>4</td><td rowspan="3">rhyme awareness</td></tr>
<tr><td>5</td><td rowspan="2">Discrimination Net.</td><td rowspan="5">- words and sounds interrelated.
- understand that sounds are constituents of words
- understand that the same sound can occur in different positions
- see beyond the cohesiveness of a word</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td><td rowspan="3">Phonological Recoding Phase</td><td rowspan="3">phonemic awareness</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td><td rowspan="2">rhyme division</td></tr>
<tr><td>10</td><td>Orthographic Phase</td></tr>
<tr><td>Adult</td><td>Direct Procedure</td><td></td><td>fully specified phonology</td></tr>
</table>

When the information is juxtaposed in this manner, the correlations between the reading stages and the phonological development become visually very obvious. Bruce (1964) states that age 7 is a crucial age for the child with regard to the logical obstacles a reader must overcome. As the table shows the development of phonemic awareness occurs after the child abandons the less complex methods of reading in favour of a phonological system which is the embryonic form of the literate adult phonology. No doubt the change to development of such a system is linked to a minimal cognitive maturity level - which appears to be reached at age 7 (in the same

manner as the division of the syllable into onset and rhyme occurs at a mental age of 4). It may also be linked to the size of the vocabulary and the lack of economy of the early reading methods. Another likely motivation is that it is an attempt to try to create a phonological unit which is of similar size and composition to the orthographic units which have been introduced, i.e. a single grapheme does not correspond generally with the rhyme of a syllable. The phonological level maps onto the orthography in a more efficient manner, and as every word's unique spelling has to be known, a phonology constructed at a segmental level would be more economical. The development of the peak and coda appears to begin sporadically at around 8 years of age (Treiman (1985)). From this point on the system is fully defined from a phonological perspective, although it does not appear to be used all the time as children revert to older methods for some reading. At 10 years old the orthographic phase is entered. This phase depends crucially on the Morpheme Spelling Principle. From this point on the system is merely fine-tuned as all the relevant information has been gained and the optimal system constructed for storage of lexical items.

This conclusion of this section ultimately hinges on two factors. As was discussed above, adult illiterates do not develop a phonemic system, which proves the relevance of literacy in phonological development. Of greater importance than this though is the relevance of the alphabetic writing system. The ability to read and write does not in itself trigger the construction of a phonemic level as the study of children who use a syllabary and/or ideographs shows. The conclusion which must be drawn from this (and from this chapter) can therefore simply be stated in the following way:

> **Segmental Phonology (as it is conventionally understood) does not develop in the absence of literacy utilising an alphabetic writing system.**

Chapter 3

The Primacy Issue.

3.1 Distinct or related? The relationship between orthography and phonology in the literate speaker.

In the previous chapter it was established that segmental phonology does not develop in the absence of alphabetical literacy. What was not dealt with explicitly is the fact that any speaker who has become literate has to deal with two sets of information which must be reconciled within their language mechanism: the written form (orthography) and the spoken form (phonology). In this section the relationship between the two sets of information is examined to ascertain how they relate to one another, if at all, for the literate adult. A cursory examination of this issue reveals two possibilities for configuration of the two systems in the literate speaker: firstly, there is the possibility that the two systems are totally distinct, i.e. they are completely unrelated except that they are different modes of the same language - an option which even at a first glance appears to be incorrect (see sections 3.2.0 - 3.2.3 below for reasons why this option is unlikely). The other options derive from the possibility that the two modes are related to one another in a fundamental way. On this assumption there are two further possibilities:

(1) that the phonology is primary with the orthography in some capacity influenced by it (or derived from it); or
(2) that the orthography is primary with the phonology in some capacity influenced by it (or derived from it)

This section does not examine these three possibilities as distinct topics, but rather looks at the problem as a whole to establish which solution(s) make the most logical sense and, more fundamental than this, which of the options outlined are even viable at all.

As was stated in previous sections there is an obvious relationship between the orthography and the phonology in the sense that without the orthography the segment-level phonology does not exist. That the orthography is needed to build the phonology, however, is irrelevant to the question of whether or not they remain linked after full literacy is achieved. What is required is some evidence that there is a relationship between the orthography and the phonology after a speaker is fully literate, beyond the basic sound-spelling correlations. This section will endeavour to achieve two goals in the pursuit of this issue. Firstly, an examination of various studies and work which suggest a relationship between the two language modes will be undertaken. The selection of the evidence focuses on studies which do not specifically undertake research on literacy and phonology, but rather are papers which note orthographic influence in phonological operations independent of studies specifically regarding literacy. The studies in this section therefore note anomalous phonological information which cannot be accounted for within conventional phonological theories. The second part of this section explores the possibilities for the relationship between the modes which the first section outlines.

3.2.0 The 'Tip of the Tongue' Phenomenon.

Brown & McNeill (1966) examine the 'Tip of the Tongue' state (TOT) and the different kinds of linguistic information available to a speaker when in this state. The definition from William James (1893)[1] gives a good definition of TOT (cited in Brown & McNeill (1966):

> Suppose we try to recall a forgotten name. The state of our conscious is peculiar. There is a gap therein; but no mere gap. It is a gap that is intensely active. A sort of wraith of the name is in it, beckoning us in a given direction, making us at once tingle with the sense of our closeness and then letting us

[1] James' definition is used here as it does, I feel, capture the essence of TOT in a very nice way. It may seem a little archaic, but it describes what we feel in TOT state.

> sink back without the longed for term. If wrong names are proposed to us, this singularly definite gap acts immediately so as to negate them. They do not fit into its mould. And the gap of one word does not feel like the gap of another, all empty of content as both might seem necessarily to be when described as gaps.

TOT involves difficulty in recalling a specific word. In its place, as James defines, is a 'wraith' of the word which is of such a specific shape and composition that another word of similar composition does not fit in the gap, even if the similarity is very great. The area of relevance though is that this empty slot holds more information about the specific word than just information which is phonological in nature. Most relevant here: orthographic information.

In their study of TOT Brown & McNeill tried to precipitate the TOT state in college student subjects in the following way. The subjects were given definitions of low frequency words one at a time and were asked after each definition if they knew what the test word was. The object of this approach was to evoke a state of TOT in the subjects, i.e. the subjects may know the low frequency word even although they would rarely use it and the definitions were thought to be enough to maybe remind the person of the word, but not great enough to allow full recall of the word. The purpose was not merely to get people into the TOT state, but was to establish what information regarding the target word was available to the subjects while still in a state where they could not recall the word. So while in the TOT state the subjects were asked to try to answer a series of questions about the word they were trying to recall. The subjects endeavoured to give the following information with regard to the target word:

(1) Number of syllables of target word (1-5).
(2) Initial letter.
(3) Words of similar sound to the target word.
(4) Words of similar meaning.
(5) The word the subject had in mind if not the target word.

Of greatest relevance to this thesis is (2): could the subject name the letter the target word began with? The results of the study show that in 57% of the documented cases the speaker correctly named the initial letter.[2] This is obviously much higher than chance - although Brown & McNeill do not calculate what chance would be in such a task and it is obviously not merely a case of a one-in-twenty-six chance to name the correct initial letter because frequency of a given initial letter as a percentage of the entire lexicon would also be of relevance. That the percentage is 57% though is an indicator that the orthographic information - certainly as pertains to the initial letter - is available to the speaker in TOT state. This in itself is strong evidence (although somewhat limited) for orthography playing a role in the storage and recall of lexical items. Brown and McNeill state the following as a result of their study (1966, 329):

> The evidence for significantly accurate generic recall of initial letters is even stronger than for syllables.

The orthography appears here in a purely phonological task in the TOT state; a situation which poses the fundamental question: why should orthography be appealed to in an apparent purely phonological task? One possible answer to this question is that the speaker's normal retrieval mechanism has failed - thus the reason they are in the TOT state in the first place - and that as such every available piece of information for a given lexical item is appealed to try to retrieve the word (including the written form of the word). This solution could be seen as counter-evidence against an orthographic role in general phonological operations, although the position is weak because it assumes a vastly different mechanism for retrieval if there is difficulty in recall of a word than the mechanism which would normally be employed. The other possibility to account for the appearance of orthographic information is that it

[2] It is worth noting that the results here may be being masked by overlap between single initial letters which correspond 1:1 with a phoneme. For example, if the speaker can state in TOT state that *Philip* begins with <p> then they have named the initial letter. If however they say the initial letter of *Patrick* is <p>, there is no way to ascertain whether this naming is orthographic or phonological in nature. Brown & McNeill do not state whether all of the examples involved in the 57% statistic were of the *Philip* type, which leaves its validity as an accurate figure a little questionable.

(orthography) is always available in phonological operations in some capacity. This possibility is more appealing for the same reason the other solution is not: it gives a uniformity to both the normal operation of recall and the failure of the same mechanism, i.e. orthography is always a part of the system.

Brown and McNeill's study does not specifically examine the influence or status of orthography in the phonological system, so does not deal with the issue in great detail. However, the appearance of this orthographic information in the TOT state does suggest a greater role for the orthography within the language mechanism whether that influence points to the underlying form or to a cross-referencing system. Which of these possibilities cannot be established from the TOT experiments. The problem is that the TOT state itself, as an error in the usual processing mechanism, may be enough to devalue the study as possible evidence of any relationship, because TOT is a state totally linked with failure of a linguistic mechanism. Thankfully, though, Brown and McNeill is not the only paper to note orthographic interference.

3.2.1 Orthographic Underlyers?

Nathan (1979) deals with the issue of orthographic interference on the phonology in greater depth than Brown and McNeill although his sources of information perhaps can be seen as not as valid since they do not follow the systematic empirical approach employed by Brown and McNeill. Nathan's evidence comes from an examination of anecdotal evidence he has noted both while teaching and from pronunciations noted from his family.[3] His primary aim is to examine 'the representation of how the speaker of a language mentally stores the words in their internal lexicon and how they perceive the utterances of others (more specifically, what sounds they perceive

[3] Although the basic tenets of Nathan's arguments are, I believe, correct I have examined other solutions to the issues in order to maintain an objective approach to the issues.

words to contain)' Nathan (1979: 144). The motivation for the paper in part comes from the debate regarding English underlyers. The position Nathan favours is in opposition to the SPE style abstract underlyer: Natural Phonology. Natural Phonology assumes the underlyer is close to the surface phonological form, no more complex than, or any further removed from, the 'traditional phonemic level' (Nathan (1979: 144). The object of interest for Nathan is that the 'phonological facts' he describes in this paper cannot be accounted for (by either Natural Phonology or SPE style abstract underlyers) without positing 'a much more central theoretical role [for the orthography] than is normally accorded'. In his endeavour to exemplify this central role he notes a number of anomalous examples which are compelling evidence with regard to the status of orthography as it pertains to the underlying form.

The first example he discusses is the difficulty his introductory linguistics students have in hearing the contrast between [θ] and [ð], i.e. *thin*, *then* (1979: 145). He suggests that the reason for this is because these initial sounds are spelled the same and that as a result of this shared spelling people do not differentiate the sounds easily. But in this case it cannot be ruled out that the lack of contrast is not noticed due to the fact that words like *then, there*, etc. are function words and the only ones to have [ð] in initial position. If a minimal pair such as *mouth*(n.)/*mouth*(v.) had been used the result would surely have been different,[4] i.e. the fact they sound different would be the relevant feature to distinguish the verb from the noun if it is a final sound. In initial position there is the possibility that a rule such as

General rule: word initial dental fricatives are voiced in function words and voiceless in all other cases

[4] Although my own experience of students' first encounters with phonetics and phonology would lead me ultimately to conclude that Nathan's solution is correct, the alternative possibility cannot be ignored.

may exist, which perhaps leaves this particular contrast ambiguous as regards the role of the orthography as a contrast neutraliser for the speakers. Consider a word like *Thames* [tɛmz]. The only possible Spelling Pronunciation for this word is [θemz] not *[ðemz]. This highlights that the nature of the subgroup (a closed class) is perhaps the factor which hinders the subjects' differentiation of *thin* and *then.* In other words: perhaps for a speaker there really is no contrast between [ð] and [θ] in initial position at the level of function words versus lexical words. Despite this possible alternative solution, it is likely that Nathan *is* noting the correct reason for the subjects' inability to hear the contrast.

The next examples Nathan turns to involve the 'long' and 'short' variants of the vowel graphs <a, e, i, o, u> as are used in the very early stages of being taught to read at school (as anyone who remember being taught to read in British schools will corroborate) (1979: 145). In very basic terms the vowel qualities associated are bound by a relationship between the relevant vowel and a final <e> in a word: the 'short' variants of vowels occur in the environment $C\_C_1(C_1)$, e.g. *bat*, *miss* (the total set being /a, ɛ, ɪ, ɔ, ʌ/); and the 'long' variants occur in the environment $C\_C_1(C_2)$<e>, e.g. *late*, *baste* (total set /e, i[5], aɪ, o, (j)u/). The terminology 'long'/'short' is somewhat misleading as the qualitative difference is of greatest

[5] The tendency with regard to the spelling of the long variant /i/ appears to be to double the <e> graph as in *beer,* although the environment above also occurs, e.g. *recede*. The doubling of the other vowel graphs also occurs although these cannot always be seen as part of this long/short set because the spellings correspond to vowels which are not always part of this group, i.e. *Aaron*, *boot*, *Hawaii*. The *Aaron* example here does yield the correct 'long' vowel, however in this case a speaker who has never before encountered the name is more likely to assume a spelling pronunciation /arən/ than assume that double <a> is /e/ (in other words in Present day English <aa> does not necessarily lead to /e/, except for those who know Biblical names or know someone called Aaron). Note doubling of <u> has now become a single graph <w> and is also not part of this set today. Venezky (1970) refers to these 'long' and 'short' variants as Free Alternants and Checked Alternants respectively. With regard to the free variant of /i/ Venezky considers the <e(C)e> pattern to be the 'Major Pattern'. However, I would argue though that the fact the double <ee> has survived intact as an orthographic unit where the other double vowels which appear historically (see Görlach (1993: 46) have been lost is strong evidence that <ee> is the preferred way of representing /i/ (i.e. its resilience is probably due to its dominant role as the preferred spelling of /i/). The examples Venezky cites are *athlete*, *mete* and *penal*, which do not seem the most obvious representations of the orthographic representation of /i/ (see *bee, feel, cheese*). The *cheese* example shows both of the lengthening methods employed by the spelling system - although the final <e> may be more for the benefit of the <s> → /z/ correlation.

relevance not necessarily the vowel length (consider accents such as Scottish Standard English), but this is the terminology Nathan uses - as did the school of my childhood. Nathan describes the difficulty of explaining to students that the vowels in *hid* and *hide* are more dissimilar than those in *hid* and *heed* from an articulatory perspective. The difficulty encountered appears to be because the speaker has for the greater part of their life been under the misapprehension that there are only 'five vowels and twenty one consonants' in the English language, and that the vowels have 'long' and 'short' variants as just outlined.[6] In other words as most speakers do not encounter language from the perspective of linguistic study they do not update (and have no need to update) the information they were taught at school because for the literate adult literacy is obviously automatic and 'long' versus 'short' is just as irrelevant to them at a conscious level as the articulatory similarity of /i/ and /ɪ/; whereas the appearance in *hid* and *hide* of the <i> makes sense at both a visual level as well as tying in with their school-based conception of vowels. The relevance of the graphemic interference on the phonetic reality of Nathan's example prompts him to turn to the relative prominence of the orthography within a speaker's language system. In the pursuit of this, he moves on to discuss the occurrence of 'errors' which cannot be accounted for in terms of abstract underlyers or through Natural Phonology.

The first example is the counter-etymological synchronic resurfacing of /t/ in <often>. This is an example of the re-emergence of a historically lost segment due to the influence of the word's spelling. The motivation for the insertion of the /t/ may be sociolinguistic, with the variable appearing where the speaker is endeavouring to adhere as much as possible to the spelling of the word to give the most proper (or spelling true) pronunciation, following Dr. Johnson's recommendation: 'In

[6] This misconception (although an irrelevant misconception for the normal native speaker of English - who is not a linguist) is addressed by Carney (1998) in a paper which appears in the book *Language Myths*. This paper highlights the non-linguist's lack of awareness of the diversity of phonemes in their language.

pronunciation, the best general rule is to consider those as the most elegant speakers who deviate least from the written word'; a maxim which appears to have survived as a concept although by some is seen as a little pedantic, going 'above and beyond the standards of normal linguistic decency' (Lambert (1972)). The frequency of Spelling Pronunciation though would argue against Lambert. My own view regarding the phenomenon of Spelling Pronunciation is that the frequency of its occurrence does not so much reflect a social willingness to adhere to the spelling to become a more 'elegant speaker', but rather that it is a fundamental by-product of literacy and the literate's underlying language system (see section 4.7). Regardless of the motivation for the process, the fact speaks for itself: for some reason, some speakers insert a segment which causes the outcome to be one which is more aligned with the spelled form - with disregard to the historical position as regards loss of the segment. This is the point of interest because it at very least points to a reference to the orthography when a spoken word is to be produced; but perhaps more fundamental than this, there is the possibility that the orthography is the *source* of phonological information for the literate and that Spelling Pronunciation, which merely follows the most basic phonological representation of the orthographic form, is used in preference to a pronunciation which does not adhere to the spelling. To state the situation in a more simplified form: it is a possibility that the speech production mechanism has a preferential tendency for orthographic information to be represented by the phonological form as closely as possible. In other words the system tries to adhere to the basic principle that a spelled form is maximally represented at a phonological level within the constraints of orthographic conventions.[7] In the *often* example, the maximal phonological form requires the <t> (which is obviously normally /t/) to appear in the pronunciation, giving the more 'spelling-true' pronunciation *[ɔftən].

[7] Orthographic conventions obviously limit Spelling Pronunciations somewhat in that spelling features such as silent letters, final <e>, etc. don't really feature in Spelling Pronunciation.

The phenomenon is an odd but very frequent occurrence which suggests a dominant role for the orthography in the speech production mechanism. The re-emergence of the /t/ in the above case appears to be a weakening of the etymological development, which states that in the word <often> the <t> should have no phonological correlate. This suggests there is competition between a Non-Spelling Pronunciation and a Spelling Pronunciation, with one pronunciation blocking the other (cf. Kerek in Chapter 1). I shall return to this issue in later sections.

One of the regularly cited examples of spelling influence is the word <forehead>. As Nathan notes the word <forehead> no longer rhymes with <horrid> due to the influence of the spelling - the present day pronunciation being a Spelling Pronunciation. Another similar example is <waistcoat> which has moved from a 17th century pronunciation of ['wɪskət][8] to a reinstatement of a spelling based form in the 19th century ['westkot] which is still in use today - although in Southern accents the vowels are diphthongal in quality. What has occurred with these two examples is that the spelling has been converted in its most basic way to a phonological form, perhaps because the pronunciation has got too far out of step with the spelling. Luick (1903: 304) states:

> Nicht bloss haben sich die typischen lautwerte der buchstaben zum teil beträchtlich von denjenigen entfernt, welche in den anderen garmanishen und in den romanischen sprachen zumeist gelten, sondern es giebt auch viele wörter, welche gegenüber diesen spezifisch englishen lautwerten ausnahmen darstallen. Wenn solche wörter im mündlichen gebrauch selten sind, so dass sie vorwiegend gelessen und geschrieben, nur wenig gehört oder gesprochen werden, wenn also das schriftbild nicht ein vom gedachtnis festgehaltenes lautbild auslöst, sondern analogisch in ein solches umgesetzt werden muss. Leigt es nahe, den buchstaben die gewöhnlichen, typischen lautwerte betrchtlich entfernen, und es entstehen neue lautungen, welche sich manchmal von den ursprunglichen beträchtlich entfernen.[9]

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[8] Note ['wɪskət] still exists in some regional dialects.

[9] Translation: 'Not only have the typical pronunciations of the letters become further removed - in some instances substantially - from those which are frequently valid in other Germanic and Romance languages, but there are also many words which constitute exceptions to these specifically English pronunciations. If such words are rare in spoken language, i.e. they are predominantly read and written but rarely heard or spoken, then the written image does not trigger the sound image which is fixed in

This more specifically refers to rare words, however the principle being described is relevant to all Spelling Pronunciation. The graphemes appear to have a synchronic value which holds the pronunciation in check but *only* from the synchronic perspective, i.e. if the pronunciation is too far removed from the spelled form the pronunciation will be reformulated more accurately with regard to the spelling.[10] So although diachronic change occurs with respect to the values of the alphabetic letters, the fixed spelling is in reality holding the pronunciation in check from the synchronic perspective. In short, it appears that there is a normalising effect of the orthography on the pronunciation (synchronically).

The main area of interest for Nathan in this paper is an examination of examples of present-day phonological operations which seem to point to a reanalysis of the underlyer into an orthographic form for storage purposes. His examples are from British English speakers' pronunciation of Hawaiian words. Of the more interesting examples is the pronunciation of the <Pali Highway> pronounced [pali] in Hawaii. The subject heard the form on the radio and reproduced it later as [peli]. As Nathan correctly points out there seems to have been a conversion of the word to an orthographic form of some description for storage, an underlying form which has then been wrongly interpreted for production of the form [peli]. Nathan suggests this is due to storage at an orthographic level, although he does not give an account of how the word may have been stored other than 'it seems fairly clear that her storage of that name was in terms of the letters used to write it rather than in the pronunciations' (1979: 146). It seems likely though that the speaker has stored this form with an orthographic underlying form with the correct vowel letter assigned to it

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the memory, but instead is transformed into one by analogy, using the next best thing which is to assign the normal, typical pronunciations to the letters, with the result that the pronunciations can sometimes be considerably removed from the originals.'

[10] There is greater irregularity in the most commonly used words than in all the rest of the vocabulary (Kucera and Francis (1967)). This regularity of use seems to nullify any possible effect of the spelling pronunciation over the 'true' pronunciation. (cf. Section 1.3.0). For less common words though, and especially uncommon words, the possibility of Spelling Pronunciation is very great.

(how else would /a/ be represented except with <a>?) but with only a single <l>. This would give only a few possible ways of storing the word:[11] <pali>, <paly> or <palee>. In any one of these cases the return to the entry could yield the incorrect vowel as the possibility of contamination of the <a> from the vowel graph(s) which follow the <l> is very likely due to the lack of a blocking effect that a double <l> would produce. The [peli] form is therefore an obvious interpretation, if this is indeed how the underlyer was stored. It is still unclear why the pronunciation spelling (<*pally*>) was not used if an orthographic representation was required.

Nathan also cites examples which involve metathesis. The examples he notes here are interesting as they show that the errors cannot be accounted for by the phonology. The speech errors involve the words <pervert> and <perfume> with the errors noted as [privə˞t] and [prifjum] respectively. The problem from the phonological perspective is that in these errors the phonemes do not correlate with the phonemes in the correct pronunciation:

> /pər/ or /pə˞/ has somehow become /pri/ not /prə/ or /prɛ/.[12]

If the metathesis occurs at an orthographic level prior to phoneme assignment however the error can be accounted for:

> <per-> → <pre-> → /pri-/

This is indeed the solution Nathan favours, a solution which places the orthography firmly in the role of underlying form. This is strong evidence for the position of underlying orthography with the phonology derived from it (although there is not enough evidence and what there is is a little anecdotal). The evidence does seem to

[11] It is possible the subject had seen the word, as this would be the most likely solution to the rogue pronunciation.

[12] The motivation for the /ɛ/ vowel is the result of schwa appearing in a stressed environment. See 3.2.3 below.

point to literate speakers 'writing' every word they encounter into their lexicon as their method of storage.

Nathan also explores the dominant position of the orthography through an examination of the regularisation of foreign words. He describes how there are two possible ways to borrow new words from a donor language: phonological and orthographic; with the fate of the borrowings following a (fairly) standard pattern for each. Words borrowed from languages which do not use the Roman alphabet are translated at a phonological level into a phonological form which maps as closely as possible to the original donor phonology but within the constraints of the phonemic inventory of the recipient language, i.e. the language which borrows the word mimics the donor phonology as closely as possible within their own phonological system. An orthographic form is then generated on the basis of this phonological form: a pronunciation spelling. The problem is that the orthography changes its value diachronically forcing the pronunciation of any such borrowed words to follow the synchronic norms and thus forcing a pronunciation change. Nathan cites as an example the Hindi word *thug* which is pronounced [thəg] in Hindi. The 19th century orthographic representation was <thug>, as it is today, but in the 19th century each graph represented a segment of the phonology. The problem (if it is a problem) is that the <th> graph combination is almost always the dental fricative in English and this strong spelling/sound correlation eroded the original phonology into the pronunciation we have today [θʌg] - a Spelling Pronunciation. Other words from similar backgrounds doubtless follow the same pattern (see section 1.4).

The effect on words borrowed into English in orthographic form is much more disruptive to the original pronunciation of the donor language:

> ...when the language that we are borrowing from uses some variety of the Roman alphabet, it is time to say goodbye to anything resembling the original pronunciation in the donor language. The word is simply changed so that its pronunciation matches its spelling according to the English spelling rules. [...] for speakers of English what counts is the spelling. Nathan (1979: 147)

The domination of the orthography to phonology rules in the recipient language over the donor's original phonological encoding is extreme in this situation. An example is the aeronautical term <empenage> borrowed from French. As Nathan points out the phonological form which would adhere most to the French pronunciation would be [ampənaʒ] (GA), however the spelling has regularised the word to [ɛmpənaʒ].[13] The other option would be for the donor spelling to be regularised to the English spelling system with the donor phonology left intact, *<ompennage> (a similar process to <thug> above). For words donated from languages which utilise the Roman alphabet though this never occurs. As Nathan says: 'The pronunciation always changes to fit the English value of the spelling regardless of the effect on the original word' (1979: 147) (cf. *Reims*, *Paris*, etc.)

A final point made by Nathan is also very interesting. He notes that the intuitive feeling of English speakers is that they do not feel they really know a word until they know how to spell it (1979: 147). This could suggest that a person merely wants to have the word available for use in both written and spoken media. There is also the possibility, however, that the orthography *is* needed for correct and systematic word storage for literate speakers. In other words, speakers *do not* know a word before they can spell it as it cannot be stored in the same way as the rest of the literate lexicon. To conclude the paper, Nathan proposes that the orthography restructures the lexical representation in a fundamental way; or in other words the orthography is in some capacity a part of the underlyer - at least of storage. The position of orthography as a related form to the phonology is much strengthened by this paper, although overall Nathan's data is too limited and anecdotal. Conceptually

[13] Note the OED now notes this as /ɛmpɛnɪdʒ/. The foreign sounding /ʒ/ noted in Nathan has been replaced with the more standard English pronunciation of <-age> /ɪdʒ/. This shows the speed with which orthographically driven changes can occur as compared with phonological changes (less than 25 years in this case).

though the paper makes some convincing points with regard to the status of orthographic information.

3.2.2 Full Vowel Underlyers?

Taft & Hambly (1985) examine the relevance of orthography to phonological representations in the lexicon. This paper is perhaps more valid than the concepts and ideas posited by Nathan purely because it is the interpretation of a series of tests based on the hypothesis that orthography has a more central status within the language mechanism than is conventionally attributed to it. As such it can perhaps be seen as stronger evidence of an orthographic effect on the phonological system after literacy attainment. The study examines two areas, although I shall not be dealing with the second part of the study as it is an attempt to prove the psychological reality of the Basic Orthographic Syllable Structure[14] - a linguistic unit which is controversial from the perspective that the results of the original study have never been independently reproduced leaving BOSS with a rather dubious psychological status. The first section on the other hand is far less open to the criticism which can be levelled at BOSS. It examines the nature of the morphophonemic lexical representations proposed in SPE (1991) to establish how, if at all, they have been influenced by the orthography for the literate speaker.

In SPE, as will be discussed in Chapter 4, it is assumed that all morphologically related words share the same abstract underlyer. The surface phonetic forms are achieved through application of ordered rules which apply to the

[14] I will not examine the BOSS theory here as the original test results have never been independently reproduced. Relevant papers to the discussion on BOSS though are Taft (1979) and Lima & Pollatsek (1983). The paper by Taft originally posits the concept of BOSS (the initial orthographic syllable maximised in terms of both orthotactics and morphological principles, and utilised for lexical access purposes), justifying it through a series of experiments. Lima & Pollatsek attack Taft (quite convincingly) on the basis that they could not reproduce the results of Taft (1979). Also undertaken by Lima & Pollatsek were experiments which showed that BOSS was not as good as the whole word for access purposes. So in short the overall argument shows that whole word lexical access appears to be more likely than a system which utilises the rather abstract BOSS unit.

abstract underlyers. In such a system words such as *metal* and *metallic* share the same morphophonemic form /mɛtal/. The full lax vowels /ɛ/ and /a/ appear in the underlyer for *metal* as a result of the speaker's encounters with both /mɛtəl/ and /mətalɪk/. It is assumed that the speaker can extrapolate (presumably at a subconscious level from the similarity of the rest of the word) that the two words are not distinct words but different realisations of the same morpheme. This then allows the full vowels from both forms to be conflated into one abstract underlyer (cf. Anderson (1981)). The problem with the system is that it relies crucially on the fact that the speaker has first to encounter both forms of the morpheme and at some level relate the forms to produce the 'full' underlyer[15]. A greater problem than this is that some words do not have alternant forms and as such would never have a full vowel in the underlying form in place of the schwa, e.g. *lagoon* would always have the underlyer /ləgun/[16]. Taft and Hambly also logically extend the morpheme relation concept to morphemes such as *muscle/muscular* where the same logic applied to the *metal* case above would require that the /k/ be in the underlyer due to its appearance in the affixed form. This then would show an underlying difference to the likes of *whistle* where the /t/ should not be in the underlyer as there is no alternation which would require the /t/ in the morphemic underlyer (Taft and Hambly (1985: 321)).

The method utilised by Taft and Hambly to establish whether the underlyer does take the form just outlined follows this system: a syllable is given, e.g. /mɛt/, and the subject is asked if it appears in a word, e.g. *metallic*. The length of time the subject needs to respond correctly is analysed to establish possibilities regarding how the underlyer is constructed. The correct answer to the question is 'no' as the form does not contain a full vowel in the first syllable at a surface level. If however there is to be a full vowel (if the full vowel underlyer hypothesis is correct[17]) only /mɛt/ can

[15] See 3.2.3 below.
[16] Ignoring for now the fact that SPE cannot account for schwa.
[17] The experiment was also trying to establish whether the subjects were performing the task at a surface or an underlying level. The hypothesis was that the results would show no difference in

appear in this position due to the influence of the alternate form of the morpheme /mɛtəl/ (following SPE). The other lax vowels /ɪ, a, ʌ/ and /ɔ/ are not possible as there is no morphemic alternant with any of these other vowels in the first syllable which corresponds to any other variant of {metal}. The prediction Taft and Hambly make at the outset is that the full vowel should be in the underlyer if the morphophonemic system suggested in SPE is correct and also assuming the task is undertaken at the morphophonemic level. To ascertain if this is indeed the case the length of time required to reject forms was measured on the assumption that to reject the /mɛt/ syllable would be slower than to reject the /mɪt/ syllable. In other words, if there is a full lax vowel in this position in the underlyer the subject still has to reject the /mɛt/ form as it does not appear as a full vowel in the surface form in the relevant context (/mətalɪk/). Obviously more processing would be required to decide that the answer would be 'no' in this latter case (due to the full vowel appearing in the underlyer, but being reduced in the example word) which would surely be reflected in a delay in rejecting the form, showing that the task was being undertaken at a morphophonemic level, and giving credence to the SPE account. There are various possible aspects though which need to be clarified.

If there is an underlying schwa the results would show no difference in rejection time between any of the lax vowels given in the environment /mVt/ (for the example *metal*) as all possible forms would not match the relevant syllable of the underlyer. However, if there is consistency in the times of all the lax vowels this could be interpreted in two ways: first, it could point to an underlying schwa and the concomitant statement this makes about the psychological reality of SPE's abstract underlyers; or second, it could suggest that the task was being undertaken at a surface level where the full vowel is already reduced to schwa.

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rejection times if the task was undertaken at a surface level as both /mɛt/ and /mat/ do not appear in the word *metallic*. This aspect of the experiment though is irrelevant as will become apparent later.

On the assumption that the existence of the 'correct' full vowel would be reflected in the results, though, there was the further possibility that it was not a result of the morpho-phonological underlyer, but rather would be due in some capacity to reference to the orthography. Taft and Hambly decided this distinction had to be made on the basis of papers by Seidenberg & Tanenhaus (1979) and Tanenhaus, *et al.* (1980). These papers show that a greater length of time is taken by subjects to give a response to whether words rhyme or not if the spelling of the rhymes being compared is different, even although the pronunciation of the rhyme is the same, e.g. it takes longer for subjects to register that TURN and LEARN (RP) rhyme than it does to register that TURN and BURN do. One would expect these tasks would also be totally phonological, yet the time difference in the responses suggests orthographic reference. In light of this, Taft and Hambly introduced a second set of words where there was no alternation in the morpheme, e.g. *lagoon* /ləgun/. If the SPE account is correct then the subjects should take no longer to reject /lag/ than they would /lʌg/, /lɛg/, etc., for the simple reason that the underlyer will not have been restructured as there is no word such as */lagənɪk/ to fill out the reduced vowel slot in this morpheme. The second set of words should show a different rejection time if the restructuring hypothesis is correct as they must be stored with an underlying schwa. Through introduction of this second group, Taft and Hambly remove the possibility that the SPE account is the reason for the full vowels because if the full vowels also appear in the second group it is more likely to be the case that the orthography is the source of the full vowels rather than an amalgamation of variant phonological underlyers. Also included in both groups of words were distracter items (known in the test as the inconsistent groups). These followed a pattern which would give an absolute 'no' response, e.g. does /dɪg/ appear in the word *dogmatic*? These items were the control items as they gave syllables which would not appear in the target word at either a phonological, orthographic or

morphophonemic level. The response times for these would reflect this absolute 'no' condition.

The results of the tests are intriguing. The time delays which were predicted proved to be of no use for differentiation of the groups of words. Instead of this, it was found that the error rates within the four groups of words was of great relevance. The error table is as follows:

PERCENTAGE ERRORS FOR THE FOUR EXPERIMENTAL CONDITIONS FROM TAFT AND HAMBLY (1979) EXPERIMENT 1.

Consistent	Inconsistent
e.g. /val/ /vəlɪdɪtɪ/ 73.3%	e.g. /vɔl/ /vəlɪdɪtɪ/ 21.2%
e.g. /lag/ /ləgun/ 75.5%	e.g. /lɔg/ /ləgun/ 25.2%

These error results show various things. Most notably, they show that a speaker thinks a full vowel appears in all words which have a surface schwa as is reflected by the number of errors in the 'consistent' column. Also, the results show that the perceived full vowels in alternating forms are not due to conflation of morphemic alternants (as SPE would suggest), because non-alternating forms display the same full vowel with no such conflation possibility. In light of the *lagoon* set of examples it seems far more likely that the reason a speaker thinks (at some level) that full vowels appear is that these vowels correspond directly to the vowels in the spelling, i.e. the lexicon is constructed in such a way that all underlyers, alternating or not, have a full vowel where there is a schwa in the surface phonetic form[18] - which is highlighted by the similarity in percentage errors in the 'consistent' column (over 75% of the time in both the alternating and non-alternating groups). The source of the vowel must be the orthography due to the error results in the 'inconsistent' column, because the non-spelling related syllable is correctly rejected far more frequently than

[18] This will be redefined in the second part of this section.

it is incorrectly accepted (around 75%: 25%) in both alternating and non-alternating forms.

The *whistle* and *muscle* examples discussed briefly above do not appear explicitly in the results section of Taft and Hambly, which is unfortunate. There is reference in the word list that *whistle* was tested in terms of both a consistent (/wɪst/) and inconsistent (/wɪsk/) first syllable with respective response times in milliseconds of 1268 and 835. The greater length of time needed to reject the consistent form (half as much time again as the other syllable) corresponds to the results just examined, i.e. /wɪst/ is a more probable first syllable than /wɪsk/ which does not correspond to the spelling. This evidence for a possible silent consonantal element in the underlyer though is thin.

The confusing problem with this study (and the two studies looked at previously in this chapter) is why the speaker references a phonological task through the orthography. There can be no other source for the information as the underlyers in the non-alternating set shows, yet it would seem to be uneconomical to reference the orthography arbitrarily in purely phonological tasks. There must be an alternative explanation. This is a blow for the SPE account because the non-alternating forms are treated in the same way as alternating forms which SPE does not predict.

Overall Taft and Hambly gives the strongest evidence so far of a primary role for the orthography with regard to phonological operations. The implications of this will be examined along with the other papers cited later in this section.

3.2.3 Spelling Rules in Phonological Systems.

Giegerich (1992a) is a fundamental step towards an account of how the orthography interacts with the phonology. The issues are dealt with within the framework of Lexical Phonology (LP), although the following discussion will not deal extensively with LP, i.e. which strata a spelling rule would be situated on to keep the LP theory

well constrained, etc. Instead the issues Giegerich discusses will be examined because the problems are the same within or outwith the framework of LP (although the problem is resolved in LP so a small amount of LP is required). The specific area of discussion of this paper is an examination of schwa as it corresponds to full vowels in alternating forms such as *moral ~ morality.*

The paper begins with an examination of the SPE account and the view of standard generative linguistics where linguistic competence is seen as inextricably intertwined with the idea of maximal output from minimal storage. The underlying morphemes are considered to be redundancy free forms which can account for the whole set of phonetic outputs through the extrinsic ordering of rules. In other words the underlyers are considered to have all of the information 'built-in' to allow every surface phonetic realisation of the morpheme to be derived from the abstract underlying form. As Giegerich notes there are various psycholinguistic papers which falsify this claim[19] which leaves the problem of how to account for the full vowel in forms such as /ətɔ̲mɪk/ (cf. /atə̲m/). In order to account for this alternation, information must be drawn from a source external to the phonology - as the alternation cannot be accounted for phonologically if abstract underlyers are incorrect.

Giegerich notes that the lexicon shows much greater access variation than purely phonological routes. He cites a Tip of the Tongue example from Nathan (1979) to highlight this. The explanation is reproduced here as it gives a clear account of why spelling influence in TOT is relevant rather than merely stating that the phenomenon occurs (Giegerich (1992a: 414)).

> …[Nathan's] example of a speaker remembering that somebody's name begins with the grapheme <p>, without recalling the actual name (*Philip*), clinches the point: here a lexical item is accessed through information that is not only patently absent from what 'Standard' generative theory assumes to be the underlying representation of the item - namely the phonological string

[19] Derwing (1973), Linell (1979) and, of course, Taft and Hambly (1985) outlined above.

> /fɪlɪp/ - but that is also not directly derivable from the underlying representation: the speaker remembered <p> rather than <ph> (where the latter might derive from an underlying /f/ but the former clearly does not).

The above sentence concisely outlines influence from the orthography to the underlying representation, which cannot be accounted for by appealing only to the phonology. Based on this, Giegerich suggests that a speaker memorises complete words in a form which closely resembles classical phonemic representations rather than abstract morphophonemic representations and that the representations are enriched with the information which can be noted when a speaker is in the TOT state (as discussed above). The production of words in real-time draws on this enriched representation, which is stored in memory, to give the relevant outputs, i.e. there is little 'on-line' word formation. The linguistic competence of the individual therefore is not a real-time event, as is assumed by the SPE account[20]. The more abstract morphemic and morphophonemic processes are seen by Giegerich as 'off-line' processes which feed into a word store which is then the real-time source of words (cf. Jaeger (1986), Mohanan (1986)). The status of orthography therefore is more prominent than is traditionally thought as it is a fundamental aspect of the real-time language system. This attacks the view that orthographic representations are derived from phonological representations, as proposed by Chomsky (1970). In light of the information available in the lexical representation Giegerich suggests that the traditional position (that the spoken language is primary with orthographic representations derivable from phonological representations but not vice versa) is incorrect. He suggests that there is also influence in the other direction.

To exemplify this influence from the orthographic direction, historical Spelling Pronunciations are discussed with examples given which involve word initial /h/. Historically, initial /h/ had been lost in Southern Middle English. Also,

[20] SPE concerns itself more with the 'competence' than the 'performance' of a speaker, i.e. the deepest level of a speaker's language is more relevant than the surface forms. This is fundamentally why the abstract underlyer is posited and accepted as an online word production system in SPE.

loans from French which entered the language did not have initial /h/, i.e. *hostel, hotel, humour*, etc. The spelling therefore appears to be the source of the phonological reinstatement (and in the case of the French loans, the addition) of the initial /h/. The spelling-to-sound correspondences seem to have a normative force on the pronunciation (i.e. pronunciation tries to represent spelling). Luick (1903: 304) states that such Spelling Pronunciations are likely to be words which are rare in spoken discourse. Again the problematic question which emerges from this is: what level of literacy was there in historical populations for Spelling Pronunciations to become standard? And once again the answers are unsatisfactory: it would be expected that the literate part of society would use the Spelling Pronunciation, but for the Spelling Pronunciation to become the standard, the feature would surely have had to become more widespread than just being a feature of the literate population. Also problematic is that if the words were not greatly used in spoken vocabulary, how did the illiterate population manage to use the initial /h/ at all? Why did 'h' forms become the standard forms? Either more people were literate (or partially literate) than would be expected in the Middle English period, or phonological reintroduction of phonemes occurs naturally, but in this instance follows the same pattern as modern spelling. Neither seems likely, although the former at least follows a logical pattern in that the /h/ follows the spelling directly in a manner which is not based on coincidence. These sort of enigmas recur again and again in discussions of orthography. There does not, to my knowledge, appear to be a satisfactory solution to the issue[21].

The main topic of Giegerich (1992a) is an examination of the alternation of schwa and the lax vowels (e.g. *atom* ~ *atomic*) along with the *Anderson* ~ *Andersonian* type of morphological alternants. In these examples the full vowel

[21] The syllable shape preference for filled onsets as defined in Kager (1999: 93) may account for the introduction of the initial /h/ perhaps as some kind of default onset segment. However this still does not account for why the introduction of the segment is limited only to those environments where there is an <h> in the orthography.

cannot phonologically be derived from the schwa. It is not a new claim that this set are Spelling Pronunciations (Bolinger (1981), Hudson (1984), etc.); the novelty of Giegerich's claim is that it focuses on the fact that lexical phonology predicts that they will be Spelling Pronunciations by 'blocking their phonological derivation as well as making available and adequately constraining the necessary spelling rules'.

Taking the *moral ~ morality* set Giegerich shows that there is a difficulty in both deriving and representing the relationship. Consider:

/ m ɒ r ə l /
↓ ↓
[m ə r a l + ɪ t ɪ]

/ a t ə m /
↓ ↓
[ə t ɒ m + ɪ k]

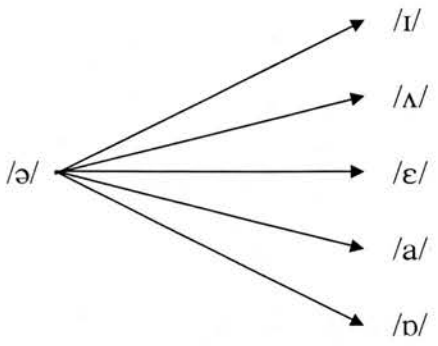
Comparison of both the simplex and the morphologically complex form shows that there is both a reduction of full vowels to schwa (/a/, /ɔ/, ... → [ə]) and the conversion of schwa to full lax vowels (/ə/ → [a], [ɔ], ...) in the affixed forms. Giegerich discusses the position of SPE which states that only vowel reduction occurs in derivation with full vowels underlying in both slots in the morpheme and the vowels reduced according to stress placement, i.e.

/ 'a t ɒ m /
↓
[ə]

/ a 't ɒ m + ɪ k /
↓
[ə]

This solution will be shown to be erroneous, but the justification for the 'reduction only hypothesis' should be examined as the motivations have relevance to the following discussion. The motivation is two fold: firstly, SPE states there would need to be two rules which were the exact inverse of one another if derivation from schwa to full vowels was allowed; a position SPE deems to be incorrect. McMahon (1990) shows that for the Vowel Shift set this is not only admissible within a grammar, but that it is the only way to account for the alternations. Problematic for the *atom ~ atomic* set is that even although rule inversions are admissible there is no way to posit an inverse rule because the outputs are not phonologically derivable. The schwa

can give rise to more than one possible output: [ɔ], [a], [ɛ], [ʌ] or [ɪ], with no information available within the phonology to dictate which one of the options should be used, i.e.



The second difficulty involves SPE's inability to account for schwa as an underlying segment. This theory-internal problem is self-imposed by Chomsky and Halle though. Not bound by such self-imposed restrictions Giegerich moves onto the more universal problem with the general SPE hypothesis.

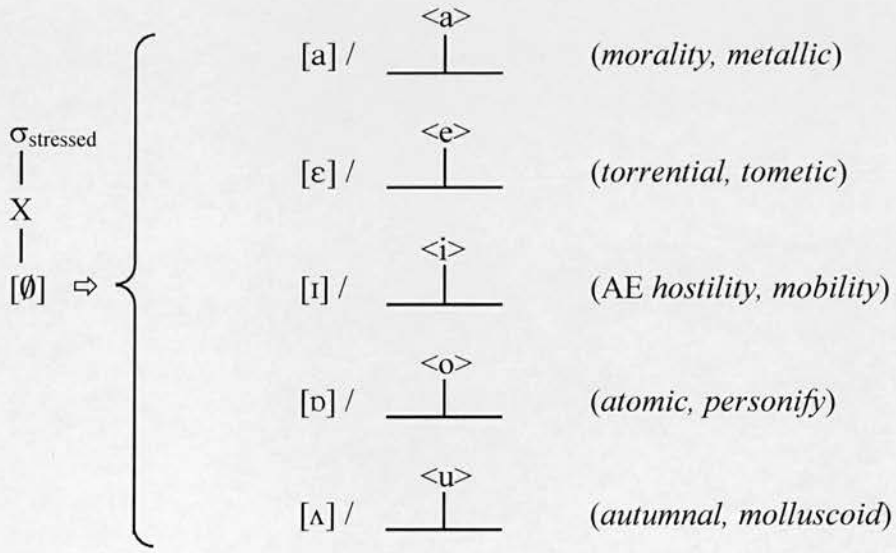
Giegerich notes that there is also a problem in that alternating forms need to be related by the speaker at some level to give the correct full vowels in the underlyer for the likes of *moral* ~ *morality* (on the assumption that restructuring of the underlyer to a full vowel occurs after all forms of the morpheme are acquired as proposed in Anderson (1981)). Under Anderson's theory the underlyer is stored with a schwa until the point where the complex form is attained, then the underlyer is restructured to give the correct full vowel in the underlyer. But there is the problem of how to store the reduced vowel until the full vowel is attained (within an SPE style analysis). But far more relevant than this is that in forms like *Fulton* ~ *Fultonian*, the complex form may never be encountered by the speaker which would leave the underlyer permanently undefined within the system. The system is obviously fraught with problems, some self-imposed and some due to the random nature of how we

encounter new words. Giegerich therefore seeks an alternative solution: a spelling rule.

In order to understand why Giegerich proposes a spelling rule, it is useful to briefly examine the workings of LP as the spelling rule is the solution to a problem LP cannot account for if the non-alternating forms are dealt with. The Lexical Phonology model for English is divided into two strata the first of which has strict cyclicity. The Strict Cycle Condition states that 'structure changing cyclic rules apply in derived environments only' Kiparsky (1985). The purpose of the strict cyclicity is to ensure that rules are properly constrained. The Elsewhere Condition is also bound up within the cycle in that if the environment is not derived, then the rule will not apply. As regards the derivation of schwa the SCC constrains the vowel reduction adequately in the class of words such as *about*, *agenda* etc. as the environment is not derived so the delinking does not occur, allowing the correct phonetic output to be produced through a default rule (post-lexical) turning all empty nuclear melodies into schwa. The problem is the effect this has on the *atom ~ atomic* set. As *atom* is an underived simplex form, delinking does not occur because the second vowel has a melodic value (/atɒm/). This means the underlying representation would need to contain 'V', i.e. /atVm/, etc., in order to predict the correct phonetic output via delinking and the default rule. This returns us to the problem of deriving several distinct vowel qualities from schwa (V) in the affixed variant, which as has been said is not possible. The problem could be solved if it is assumed that all vowels are full vowels, based on Spelling Pronunciations, which for a literate speaker may indeed be the case (as Taft & Hambly (1984) suggest). This would allow the unstressed vowels to be reduced 'across the board' by the process of delinking and the default rule would then give the correct vowel quality. The argument levelled against such a theory is that it gives 'free rides' to the *about* set, i.e. lots of redundancy. This is true, but only from the perspective of phonologically dominated system. The benefit to the

solution is that it is not as arbitrary as the abstract underlyer hypothesis. The segments would correlate to the spelling information and as such would aid a person in remembering how to spell a word. The sort of abstract underlyer proposed by SPE can be seen as arbitrary as it has no synchronic reality, where the underlyers proposed here would be synchronically valid from the spelling perspective. The stress pattern would always reduce the correct vowels to schwa so there would be no surface phonetic difference.

In order to account for the problem of the schwa in the *moral ~ morality* set Giegerich (1992a) proposes a spelling rule. The rule turns schwa into a lax vowel when the stress assignment in the derived environments causes the schwa to fill a slot which is illegal for the unstressed vowel: this is why a full vowel is required. The rule is as follows Giegerich (1992a 426):



Giegerich states that in the relevant morphological environment where lax vowels appear, this rule is exceptionless. Also the productivity of the rule can be shown through simple experiments such as the following. Subjects are asked to make adjectival forms from nouns using the affix *-ic*, e.g. the speaker is asked to make an adjective from the noun *petal* (which does not conventionally have an adjectival

form) plus *-ic*. The literate speaker will produce /pəˈtalɪk/. The 'correct' full vowel is produced by literate speakers in this environment because the orthography dictates which vowel quality should be used.[22] The only problem with the hypothesis is that there is the possibility that the full vowels exist in the underlyer for all forms (alternating or not) and that it is merely the different stress which gives the correct vowel output. This position still requires orthographic information for construction of the full vowel underlyers, but weakens a position where the orthography is referenced in real time when subjects perform this task. Another issue which arises from this task is that the subjects will question where the full vowel is coming from as they for some reason do not want to admit that the orthography is the source of their vowel quality. The usual response is that the vowel quality is based on analogy with the forms *metal* and *metallic*. This is indeed possible, although the solution again fundamentally hinges on orthographic information. The problem with the analogy assumption is that in a form such as *metallic* there is an /a/ in the second syllable due to stress placement and the <a> in the spelling. The similarity of the spelled forms for *metal* and *petal* may be drawn on by the speaker but again this makes the orthography the source of the full vowel as it is overall similarity of the *spelled* forms which is relevant. So whether it be by analogy or by direct reference to a word's spelling, orthographic information is utilised in this operation.

Further examples of spelling influence examined in Giegerich involves the effect of the morpheme {ian} with respect to the same vowel graphs (which again are schwa phonologically in the underived form), e.g. *Newt<u>o</u>n ~ Newt<u>o</u>nian*, *Maxw<u>e</u>ll ~ Maxw<u>e</u>llian*. In an experiment involving ten subjects Giegerich shows that the alternations again are predictable on the basis of spelling and various phonological

[22] I have a Norwegian friend who was studying in Edinburgh at the time I first heard of this phenomenon. I asked him to produce the adjective using <-ic> from the noun <petal> and he responded by saying ' I don't know how to spell the word <petal>, but I would think it is maybe /pəˈtɔlɪk/'. His self-confessed lack of knowledge of the spelling appears to be the reason why he did not know the correct vowel, regularising instead to the /ɔ/ phoneme.

rules such as CiV Tensing and Vowel Shift (as defined in SPE). The possible outputs are predictable (although there can be more than one interpretation). The results are outlined below (the left column is the spelling of the simplex form; the middle column has the vowel quality responses which appear in the relevant syllable in the derived form, along with how many speakers gave the given response; and the right hand column has the derivation from spelling-to-pronunciation through CiV tensing to vowel shift).[23] Note: numbers of responses which do not add up to ten were the result of some subjects declining to answer.

e.g. *Newton*	e.g. *Newtonian*	SP CiV VS	
Anderson	[o:] *10*	[ɒ] ⇨ [ɔ:] ⇨ [o:]	
Mendel	[i:] *6*, [e:] *4*	[ɛ] ⇨ [e:] ⇨ [i:]	
Gussmann	[æ] *8*	[æ] ~~⇨~~ [æ:] ~~⇨~~ [e:]	Blocked by <CC>
Britton	[o:] *8*	[ɒ] ⇨ [ɔ:] ⇨ [o:]	
Andersen	[i:] *2*, [ɛ] *4*	[ɛ] ⇨ [e:] ⇨ [i:]	
Pearlman	[e:] *2*, [æ] *5*	[æ] ⇨ [æ:] ⇨ [e:]	
Lendl	[lɛndliən] *4*, [ɪ] *1*	---	
Britten	[i:] *2*, [ɛ] *2*	[ɛ] ⇨ [e:] ⇨ [i:]	
Penzl	[pɛntsliən] *4*, [ɪ] *1*	---	
Hurford	[ɒr] ~ [ɔ:] *10*	[ɒ] ⇨ [ɔ:] ~~⇨~~ [o:]	Blocked by <CC>[24]
Handel	[i:] *6*, [ɛ] *2*, [e:] *1*	[ɛ] ⇨ [e:] ⇨ [i:]	

Giegerich considers that the derivation given in the right hand column is the reason for the various responses. The question is why do the subjects not all give the right-most vowel qualities (excluding the double consonant cases)? Presumably if every speaker had the system which allows the derivation it would be used in the same way for all speakers. That some speakers 'choose' not to follow the derivation is therefore surely a problem for the system. It is far from coincidental that the responses also tend to follow the 'long'/'short' pattern outlined previously in this section. The responses interpret the written information on the basis of either the 'long' (the VS column) or the 'short' (the SP column) variants of the relevant vowel graphs. Only

[23] The table is a slightly modified version of the Giegerich (1992a 428), example (12)a.
[24] The rhotic/non-rhotic nature of the responses appears to have an effect on this example.

five responses give the 'intermediate' CiV stage, one [e:] in the *Handel* example and four [e:]s in the *Mendel* example.[25] The rest fall within the 'long'/'short' pattern or general orthographic predictability (*Penzl* and *Lendl* have no vowel which is reflected in the majority of the responses), which means that only around 6% of the instances cannot be totally accounted for within the norms of spelling to pronunciation conventions (5 out of 80 in this study).

There is the possibility that the selection of the 'long' versus the 'short' by the speaker is on the basis of whether the new word formed when affixation has occurred is treated as a simplex or a complex item at an orthographic level, i.e. in the responses containing 'short' vowels (as in the SP column) the affix is treated as an affix and in the responses containing the 'long' vowels (the VS column) the complex morphological form is being treated as simplex, with the graphs assigned values which transcend the morphological boundaries. For example, *Pearlman* can only have [e:] in the second syllable if the <-ian> (especially the <-i>) is affecting the vowel quality of the previous syllable (cf. *man* ~ *mane* and *maniac* ~ *manner* where the latter is blocked by <CC>). The motivation to establish why some of the speakers used the 'long' over the 'short' then becomes a conscious decision by the speaker with regard to their intuitions about what sounds more correct - which is indeed what this test was devised for. The distribution of the responses corresponds with a pure orthographic explanation in this study. Also of relevance is that the orthography appears to be the source of the blocking in the *Gussmann* example (due to the effect of <nn>). It seems likely, therefore, that the orthography is the driving force behind the responses, with the anomalous information marked rather than the norm.

Giegerich shows the non-arbitrary nature of lax vowel assignment brought about by a shift in stress. What is not addressed is the possibility that when a speaker

[25] Note there is something irregular here in the responses with both of these examples. Both share the same spelling for the syllable which is effected, yet the subjects were not regular within the responses from either the perspective of pure phonological operations or from the orthographic perspective.

becomes literate the whole system can be redefined in terms of the new orthographic information and the respective phonological vowel qualities which correspond to the graphs. The orthography, morphology and phonology all seem to be inextricably intertwined leaving the very difficult question: what is the relationship between them? Giegerich (1992a) highlights a role the orthography has which is difficult to dispute, a role which shows that it is more than merely a way of representing the spoken language. The question which is now of great relevance is this: is the role of orthography greater even than that of reference information?

3.2.4 Discussion.

As was stated at the beginning of this section, there are three options with regard to the relationship between the phonology and the orthography. The above papers give, I think, persuasive arguments for a very closely intertwined relationship between the two language modes and also suggest a more prominent role for the orthography with regard to the phonological component of a literate speaker's language than is conventionally noted. In short, orthographic information does not appear to be confined only to reading and writing. The above papers were chosen to demonstrate the status of orthography because they cover the topic from an informal anecdotal level (Nathan) to the more formal study of orthographic influence through specific testing (Taft and Hambly - and to a more limited extent Giegerich). The evidence is not indisputable but it is convincing; and to ignore it would be to ignore an important aspect of the language. The subject of the next section, therefore, is to refine this role and to establish how the relationship between the modes *must* be constructed. The structure of the argumentation follows a principle whereby the logical answer is strived for, regardless of how strange or unconventional this appears. The starting point considers the following two relevant pieces of information:

1. The two modes are related (based on the studies outlined above)
2. Orthography is required to develop segmental phonology (phonemes).

3.3.0 The Plan.

As this chapter has endeavoured to show, there is very convincing evidence of a fundamental relationship between the orthography and the phonology. The previous chapter noted a causal link between a speaker becoming literate and a speaker's development of a phoneme system (phonology below the onset and rhyme). In this section these two aspects will be conflated in a theoretical examination of the issue which will be undertaken to establish which way the language modes *must* be constructed in order for the modes to correctly relate to one another and to correctly predict the outputs the language manifests.

It is worth noting at this point, and in light of the preceding discussions, that it will not be a case that the phonology is restructured when the speaker becomes literate, but rather that the information available through literacy will dictate how the orthographic/phonological system will be constructed *at its inception*. In other words the phonological system is not updated with information gained through literacy, but rather the system is constructed at the outset based on both the phonological and the orthographic information. This is an altogether more economical solution than is proposed by Anderson (1981) [26] to account for alternating forms because it does not involve changing a system so much as building a system.

[26] Anderson's solution, although part of a purely phonological model, assumes rewriting of area of the underlyer on attainment of alternating forms. It cannot account for the productivity of the *petallic* examples discussed in section 3.2.3 above.

3.3.1 The Problems.

> In a Garden-of-Eden alphabetic writing system, you would have a single letter for each speech-sound and one speech-sound for each single letter...But if we look further, we soon see that [in English] too many speech sounds are chasing too few letters. Carney (1998: 33)

There are two possible kinds of writing systems which utilise an alphabetic system. The first is the 'Garden-of-Eden' type of writing system described by Carney above: a phonemic spelling system. The second is a morphemic spelling system where a single spelling is assigned to each of a languages morphemes. There are other writing systems, for example ideographic writing (e.g. Chinese), but this is not relevant to this discussion as the symbols do not try to represent single sounds of the language thus removing the need for a relationship between the modes which the alphabetic system has.[27] There are advantages and disadvantages to both of the writing systems.

In a phonemic writing system there would be a difficulty in having a regular spelling system throughout the geographical areas where a given language is spoken. For instance, an SSE speaker is likely to say the words *word* and *heard,* /wʌrd/ and /hɛrd/ (SSE), yet an English speaker from the South-East of England would say /wɜ:d/ and /hɜ:d/. How can these speakers share a common spelling system when the pronunciation is so different?[28] On the beneficial side of the phonemic system is that it displays biuniqueness at the level of phonemes and graphemes (the one-to-one correspondences Carney talks of). This means that speakers of a language which employs a phonemic writing system could pronounce any newly encountered written words with 100% accuracy. They should also be able to write any word they can pronounce. In other words: the spelling system does not need to be learned (although speakers would require a phenomenal ability to break a word into its constituent

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[27] Disregarding the dubious value of the phonetic radical of Chinese ideographs.

[28] Cf. Chomsky and Halle's SPE: ' a conventional orthography may have a very long useful life, for a wide range of phonetically divergent dialects' (SPE: 49).

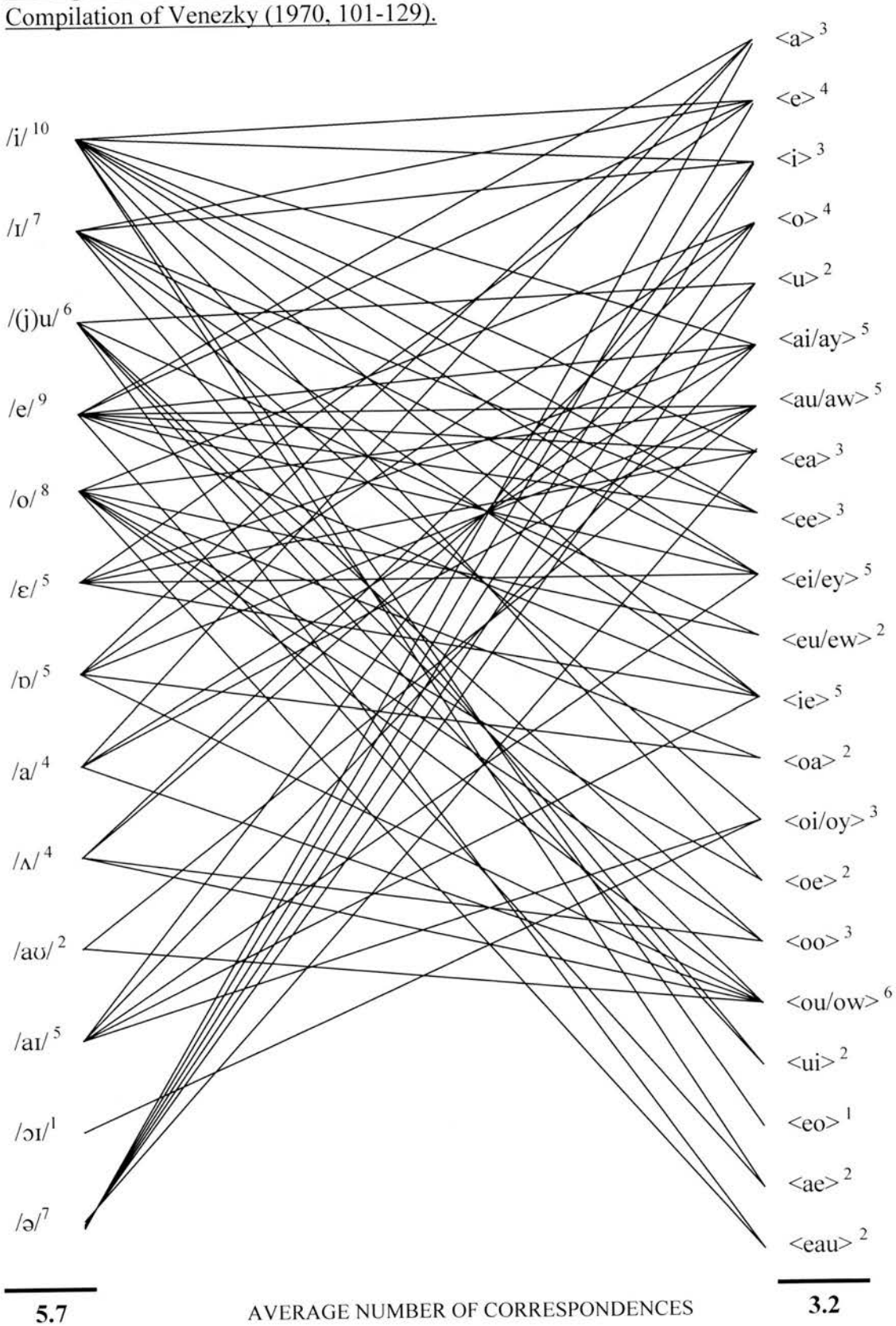
sounds to write it down. Also, there is the benefit that such a speaker would be able to learn to read more easily than a speaker of a language which employs a morphemic spelling system because the words on the page would be a direct representation to the pronunciation of the word; a situation which does not exist in a morphemic system (cf. *atom* and *atomic*).

The morphemic writing system, on the other hand, has a lack of biuniqueness which means words can share the same phoneme quality yet have different spellings, e.g. *amoeba, see, sea, leek* and *people* all share the phoneme /i/. The opposite is also true: the words can share the same spelling but have different phonemes, e.g. *hear*, *great*, *heart*. Also problematic is that a new word encountered visually is not guaranteed to be a Spelling Pronunciation which means the pronunciation is not available with any accuracy until the pronunciation of the newly encountered written form is ascertained independently of the spelled form (cf. *yacht* and *Milngavie*). A further handicap exists in that each spelling for the morpheme has to be learned because of the lack of biuniqueness between sound and spelling; the pronunciation is not a key to the spelling in every instance. Beneficial is that all instances of the morpheme are spelled the same and the morpheme spellings allow a visual regularity which is lost in a phonemic spelling system, e.g. *cats, dogs* and *horses* all share plural <s> yet the phonology is /s/, /z/ and /ɪz/. So in a writing system which employs the Morpheme Spelling System there is regularity of spelling where there is irregularity of pronunciation, which allows SSE speakers and South-Eastern speakers to share a common spelling system. This then leads to the issue of which of these two systems of writing English employs. The answer is the latter. English has a writing system which is morphemically based and employs the Morpheme Spelling System.[29]

[29] The Morpheme Spelling Principle is discussed in section 3.8.2.

3.3.2 The Biuniqueness Issue.

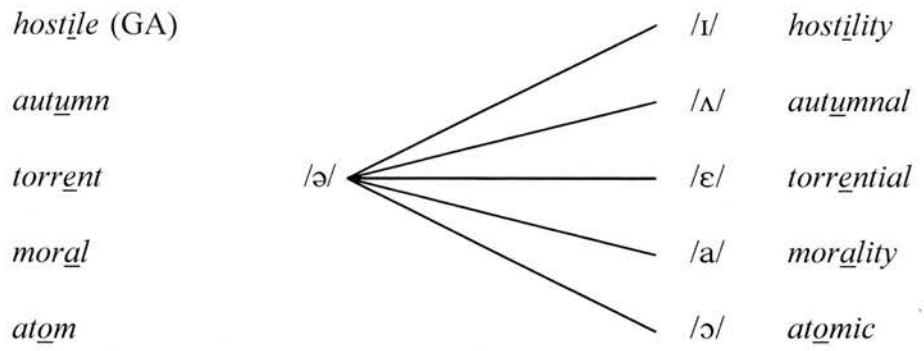
Correspondences between Vowel phonemes and Vowel Graph(s).
Compilation of Venezky (1970, 101-129).



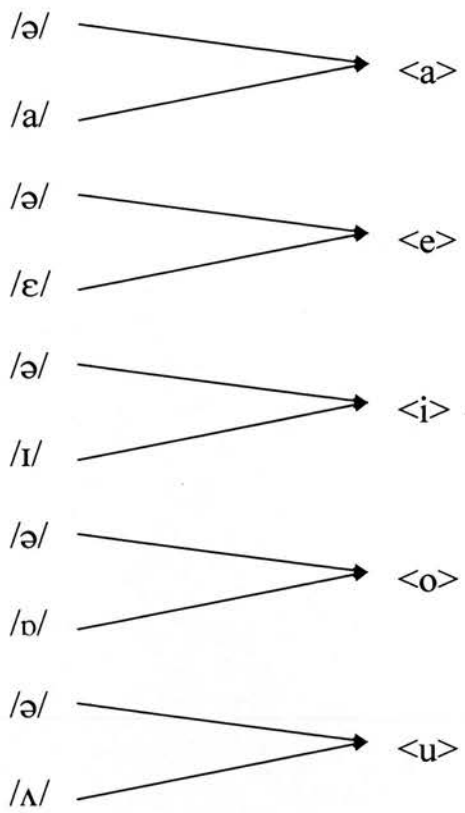
The above diagram is a visual representation of the information contained in Venezky (1970) which lists the correspondences between orthographic and phonological information for English vowels. For ease of reading, numbers have been added beside each of the phonemes or grapheme(s) which pertain to the number of correspondences a specific item has to members of the opposite mode. For example, /i/ has ten grapheme correspondences (<e>, <i>, <ai/ay>, <ea>, <ee>, <ei,ey>, <ie>, <oe>, <eo> and <ae>); where <ea> has four phonemic correspondences (/i/, /e/, /ɛ/ and /ə/). The bottom left-hand number, in bold, is the average number of graphemic correspondences an English vowel phoneme has. The bottom right-hand number, also in bold, is the average number of phonological correspondences a vowel grapheme or grapheme combination has in English. As these averages show, the grapheme-to-phoneme average is less than the phoneme-to-grapheme average across the vowel system. The average numbers show that if a system of rules is to be constructed to allow navigation from one side of the above diagram to the other, navigation from the right hand side to the left is easier than navigation from the left to the right. This is in agreement with Householder (see section 1.3.0) who suggests it is easier to write rules which work from the orthography to the phonology than vice versa. Examination of this position will involve further analysis of the lax vowel set examined by Giegerich (1992a), which is undertaken to ascertain how the two modes are related and why they must be related in a very specific manner.

3.3.3 Lax Vowels, Schwa, Spelling and Stress: the Issues.

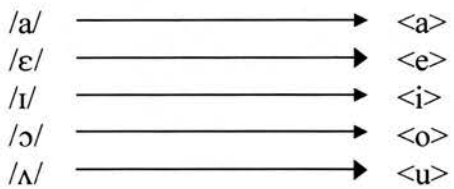
There are three aspects which are relevant to the issue of the lax vowel set, schwa and the spelling. The first is noted by Giegerich (1992a) and is reproduced here.



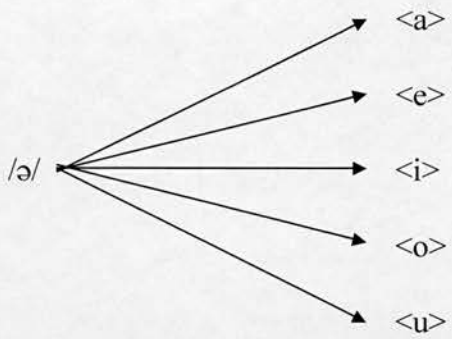
This is the representation of the problematic relationship there is between schwa and the full vowels which appear in the derived forms of the *moral~morality* set: five possible phonological outputs from one input (no biuniqueness). As has been outlined above, Giegerich proposes that the orthography is used as the dichotomiser to dictate which of the lax vowels should be selected. Giegerich abstractly uses the orthographic information as a reference set without reference to how the systems interact. If the relationship is to be adequately accounted for, the orthographic information must appear in a more defined and adequately representative manner. But when this orthographic information is represented, it soon becomes evident that the solution given in Giegerich (1992a), which shows that the answer is spelling driven, does not account for why it must be this way, or reveal the fundamental problem with schwa and the orthographic representations of the lax vowels. The following theory takes into consideration the requirement of orthography for the creation of phonology, which leads to the logical conclusion that at some level the literate speaker has related the 'new' phonology and the orthography (assuming for the moment a phonologically dominating system in the literate lexicon). In the lax vowel set the relationships between the modes can be represented as follows. (The arrow means 'can be represented by'):



What this shows is that both schwa and a specific lax vowel are represented by a specific vowel graph, i.e. /ə/ and /ŭ/ are represented by <v>. If the diagram is now broken down to 'factor out' the regular features, the problem emerges (again arrows mean 'can be represented by'). First the following relationships can be stated:



but then a more problematic aspect becomes evident:



Schwa can be represented by (at least) five vowel graphs. The second relevant issue, therefore, is that when the orthography is brought into play, the lack of biuniqueness becomes evident and problematic within the system, because there is nothing in the solution to predict which of the vowel graphs is the correct graph for any given word. This in turn will not allow reproduction of the correct vowel quality in the derived form as predicted in Giegerich (1992a). Giegerich establishes a link and a reference to the orthography and shows the rule is productive, but what is not dealt with is how the orthography performs its role, or why.

The problem is in synchronic terms nothing more than a reflection of the historical situation in that the graphs would historically have represented different sounds and thus the only relationship would be the first half of the above equations. The lack of stress and subsequent reduction of the vowels to schwa though is a problem from a phonological to orthographic perspective - a problem which cannot be overcome synchronically in a phonologically dominated system.

So far two of the relevant (and problematic) issues have been brought to the fore: the problematic phonological relationship (as defined in Giegerich) and the problematic orthography/phonology relationship. The third issue pertinent to the discussion involves the stress and is less of problem and more of a relevant factor in the whole equation. Consider the words *moral* and *morality* and the phonological realisations of each of the first two syllables.

'm ɒ r ə l	*moral*
m ə 'r a l ɪ t ɪ	*morality*

In the first syllable of *moral* there is a full vowel (/ɒ/) where in the second syllable there is a reduced vowel (/ə/). In the same morpheme in *morality* the reverse is true (/ə/ and /a/). What is it that dictates the vowel quality in these forms? The stress. The stress dictates whether the syllable will be stressed and this, as a result, will dictate whether a full lax vowel or schwa can appear in the relevant syllable:

$\sigma_{+\text{stress}}$ = lax vowel
$\sigma_{-\text{stress}}$ = /ə/

In other words schwa and the lax vowels are in complementary distribution with regard to stress (where one appears the other cannot). Obviously there is more to it than this as there is the problem with regard to which of the lax vowels will be chosen, so more correctly the situation as regards stress and the vowel quality would be:

$\sigma_{+\text{stress}}$ = lax vowel (/ɪ, ʌ, ɛ, a/ or / ɒ/ dictated by orthography)
$\sigma_{-\text{stress}}$ = /ə/

So the final factor in the riddle is the complementary distribution relationship in existence which dictates which of the vowels must be used based on stress and further defined by the orthography.

This leads to the problem of how the three pieces of information must be put together to give the required outputs. There must be a way in which the phonological problem addressed by Giegerich *and* the orthographic problem outlined above *and* the issue of stress can all be accounted for in a simple manner which predicts the correct outputs.

3.4 The Possibilities.

A fully literate speaker can speak, comprehend speech, read[30] and spell words correctly. A theory encompassing orthography and phonology must therefore be able to accurately predict all of these aspects of language. More relevantly, it should be able to correctly account for the general ways in which speakers will orally produce a newly encountered written form; or problems they would encounter with a word they did not know how to spell, etc.; for example Spelling Pronunciation or lack of accurate morphological productivity before the speaker knows the spelling.

Earlier in this chapter it was established that the two modes of the language are strongly related and, along with the previous chapter on phonological development and literacy, that the tendency suggested is one of a strong influence from the direction of the orthography to the phonology. Also at the beginning of this section the decision was made to establish general evidence of a relationship, rather than to try to examine the various possible ways in which the relationship could be constructed. Having established the strong likelihood of a relationship, the discussion will now return to the possible construction to ascertain and define the interaction which exists between the modes.

As was noted in 3.1 above there are two possibilities for the relationship between the orthography and the phonology, based on the assumption that they are related at a fundamental level - a situation which has been shown to be the case. These possibilities (repeated here for the sake of ease) are:

(1) that the phonology is primary, with the orthography in some capacity influenced by it (or derived from it); or
(2) that the orthography is primary, with the phonology in some capacity influenced by it (or derived from it)

[30] Reading is here assumed to simply mean conversion of visual information into a phonological string.

On observation we can see that (2) corresponds more accurately to the situation discussed in the previous chapter. Regardless of this, both of the possibilities will be examined in detail. Taking the above options as the basis, and introducing the three factors relevant to the issue under discussion (the phonology, the orthography and the stress), there are four possibilities for setting up the system. Each of these options will be analysed in detail. Note: the issue of orthographic stress (which is dealt with in section 3.5) may seem contentious at this point, given the unreliable representation of vowel length and syllable weight in the orthography. However, the sections below show that this can be done with surprising accuracy, when default assumptions about word stress are taken into consideration:

1. Phonological Primacy with derived orthography (stress assigned to the phonology).
2. Orthographic Primacy with derived phonology (stress assigned to the phonology).
3. Phonological Primacy with derived orthography (stress assigned on the basis of orthography representation).
4. Orthographic Primacy with derived phonology (stress assigned on the basis of orthography representation).

In the following discussion, these four possibilities will be examined to see which of them predicts the outputs and productivity displayed in English. The examples again will be drawn from the lax vowel set, with specific examples using *moral* and *morality,* although the principle is the same for any words in the set. After a brief discussion of each of the possibilities there is a short analysis of which of the four operations[31] can be achieved within the model under discussion. This analysis exemplifies the issues using the words *moral* and *morality*, exemplifying what the system requires to work, and what is actually available within the system being discussed. Confining the examples in this way allows illustration of the limitations of each of the models in as simple and clear a manner as is possible.

[31] Speech, speech comprehension, spelling and reading.

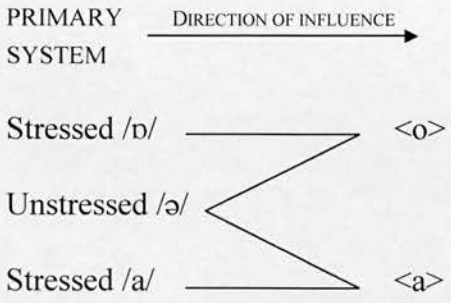
This component of the analysis endeavours to find answers to questions such as: can the subject produce the correct vowels in the morphologically complex *morality* from the simplex *moral* form (or vice versa); and can the subject read the words, or spell them correctly within the hypothetical system? The endeavour is to try to produce a model which accounts for the operations involved in conversation and reading and writing, along with the tendency for Spelling Pronunciation and the limitations of correct phonological production of morphological alternations in the absence of the spelling information.

The following models follow a fixed format. The primary system is marked as such, with an arrow indicating the direction of dominance. The secondary mode is assumed to be derived or dominated by the primary system. Assignment of the stress aspect to either the primary or secondary system gives the four possible solutions stated above. Models of each of these solutions will be evaluated to ascertain which of the aspects of the language can and cannot be coped with within each framework. This will establish that not only do some systems not work, but also that for the literate, the information must be related in a very specific manner in order for it to have the versatility that we can easily observe.

3.4.1 Phonological Primacy with derived orthography (stress assigned to the phonology).

The tendency is to assume that phonology is primary because we learn to speak before we learn to read; but the status of orthography in such a system is difficult to account for. It would be useful and easy if the orthography could be derived from the phonology, but this would reflect a phonological spelling system which, as has been discussed, is not employed by the English language. The different graphs which pertain to the schwa segment relate to historically distinct vowels that have coalesced in one unstressed phonological segment. Synchronically, therefore, deriving

orthography from phonology is impossible as the spellings have to be learned, which is not reflected in a situation where the primary system does not replicate the non-arbitrary nature of the spelled form. The model for such a system is:



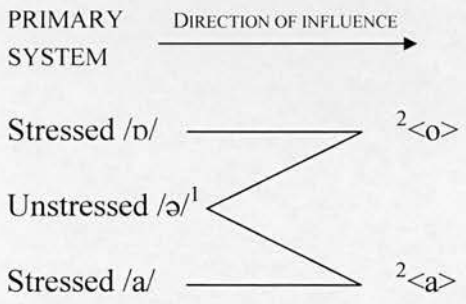
The arrow shows the direction of influence, with the primary system (the underlying forms)[32] below the source of the arrow, and the derived system below the termination.

This diagram therefore shows a primary phonological system, with stress assigned to the phonological representation. The orthography has to be derivable from the phonology in such a system, so the model reflects this as the arrows point to what can be produced from the (massively simplified) primary system. Immediately the problem referred to involving schwa and the orthographic forms can be seen in the centre of the diagram: which graph should be used to spell the schwa? This is a problem, as this model does not capture the influence of the orthography on the phonology that has been shown to exist in various sections above. In reality, a speaker has to arbitrarily learn the spelling of a word. A model (and any real theory of linguistics which is trying to observe what a speaker has to deal with in real language) must try to capture the need to learn the spelling.

[32] The primary information is assumed (for the purpose of this analysis) to be the only learned information. The other system must therefore be derivable from the primary system. This is assumed because the purpose of this section is to examine the theoretical possibilities for construction of an orthographic/phonological system, rather than to totally accurately map that the speaker will learn both aspects of the language. The outcome is the same for observation of how the systems must interact though.

This model also suffers from a mis-assignment of the relevant information available: the left-hand side is over specified while the right-hand side is underdetermined. This comes from the problem of assigning stress to the phonology. It is an empty statement to talk of stressed lax vowels and unstressed schwa because schwa can never be anything but unstressed in the relevant contexts because if it is stressed it would be a full lax vowel, with the opposite being true for the lax vowels in unstressed environments.

So how does this model cope with the demands of the operations a literate can perform (speech, speech comprehension, reading and spelling words correctly)? Does this model predict these operations and the other tendencies described earlier? Note: in reading and spelling the movement will be from right to left, although this *does not* mean there is influence in this other direction. Only the primary mode can give rise to the secondary mode in the models, not vice versa. For example, although /ɒ/ and /ə/ can be represented by <o> there is no way to establish which of the two phonemes should be used when reading, as the stress information is unavailable until after an arbitrary decision is made regarding the pronunciation. This limitation of influence direction will be the same for all the models. So overall, how does this model perform?



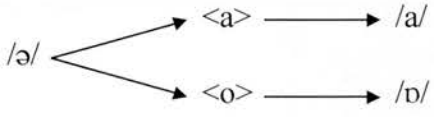
- **Speech:** On the assumption (for the sake of argument) that the speaker knew the word /ˈmɒrəl/, this speaker would not be able to derive the form /məˈralɪtɪ/ because at (1) there is a choice of either <o> or <a>, with no clue from the pronunciation which of the graphemes should represent the schwa in writing (a situation which

does not reflect the synchronic reality, where *morality* does not have an arbitrary vowel graph in its second syllable.) This situation at (1) prevents a return route, via the orthography (the right hand of the model), to the correct stressed vowel. So despite any awareness by the speaker that a stressed vowel is required (as stress is assigned to the phonological string), the relevant orthographic form is impossible to ascertain, which denies access to the correct vowel quality. Thus deriving the correct pronunciation of *morality* is impossible.

What is required to produce *moral<u>i</u>ty* from *moral*:

/ə/ ⟶ <a> ⟶ /a/

What is available in this system:



PROBLEM: two possibilities available.

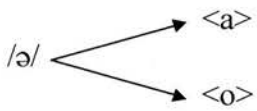
- **Speech Comprehension:**[33] All speech would be accessible in this system as the phonology is the underlying system and the comprehension of speech would directly access this area. This speaker would therefore be able to comprehend both *moral* and *morality* when spoken as they are the underlying forms and would be listed, although they would never be able to relate the two forms at a morphemic level due to the problems of relating schwa to specific lax vowels.
- **Spelling:** The speaker would encounter the same problem (1) when trying to spell either of the variants because there is nothing to determine whether the schwa in *moral* is spelled <a> or <o> from the phonology.

[33] Speech comprehension is assumed in these models to mean an accurate mapping of what is heard onto an underlying form. Obviously our brains are far more versatile than this, in that we can understand different accents, etc.

What is required to spell /'mɒrəl/:

/ə/ ⟶ <a>

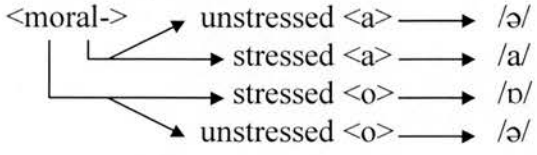
What is available:



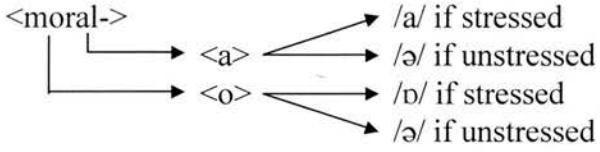
PROBLEM: two possibilities available

- **Reading:** This speaker would also not be able to read the words *moral* and *morality* with any guarantee that the correct vowel would be selected in the first two syllables, because the stress is assigned to the phonology, so it available only after the choice at (2): /a/, /ə/ or /ɒ/ in the first and second syllables of *moral* or *morality*?

What is required:



What is available:

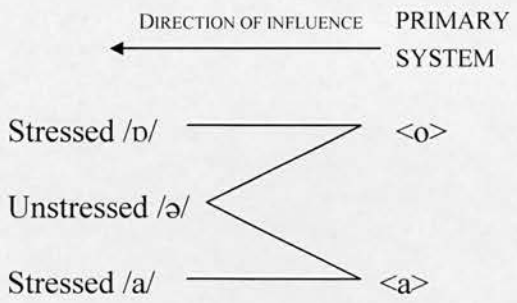


PROBLEM: information needed for decision making is only available after the decision is made.

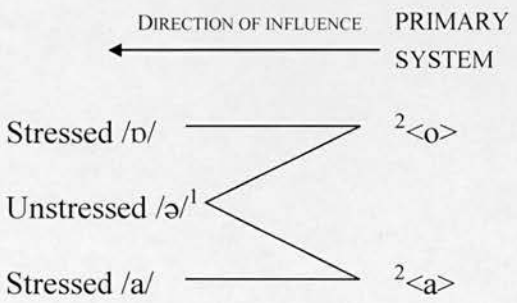
So, contrary to popular belief, this does not seem the most useful way of setting up a system which accounts for phonology and orthography. The phonology seems to be lacking the ability to predict spelled forms, while the spelled form has no route to the correct vowel quality as there is nothing to direct it.

3.4.2 Orthographic Primacy with derived phonology (stress assigned to the phonology).

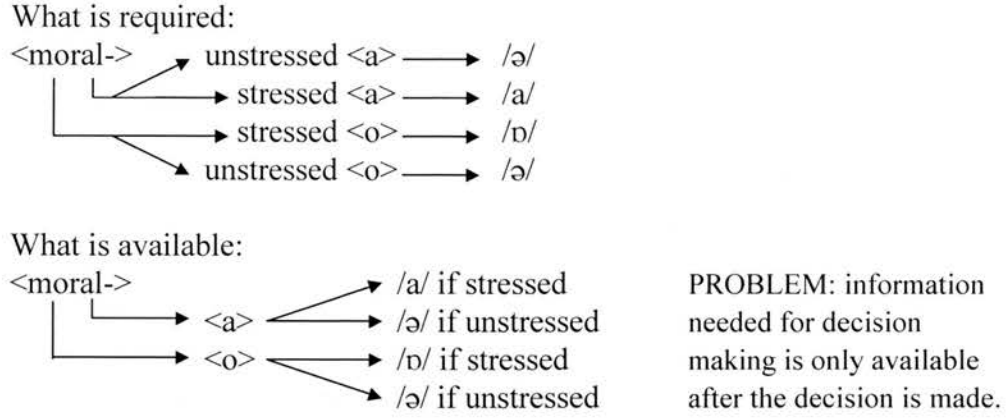
So what occurs if the primacy is moved to the orthography? Is anything gained?



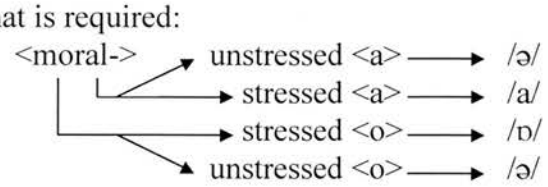
The above diagram reflects a situation where the orthography is the primary system with the influence moving from right to left, i.e. the orthography dictates the phonology. Again there is the problem of over specification on the left side of the model, although captured here is the fact that a speaker has to learn to spell, i.e. the right hand is primary so the spellings (the underlyers) must be learned - as is the case in reality when a speaker becomes literate. There are still problems in that the speaker does not know how to stress the information in the primary system to give the correct output. In terms of the processes studied here, the following would hold:



- **Speech:** This speaker would not be able to pronounce *moral* or *morality* from their underlying orthographic forms as there is no way to decide whether the vowel phonemes should be stressed or unstressed at point (2). So even although the morphemes can be related through the spelling, the system fails as there is no way to ascertain correct pronunciation from the available underlying information.

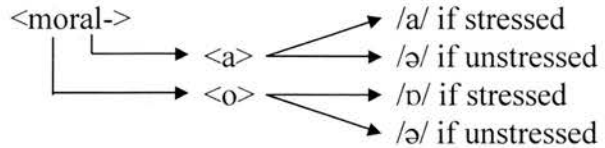


- **Speech Comprehension:** This speaker could not relate the phonological forms of *moral* or *morality* to the underlying orthographic forms as the schwa can be represented by either vowel graph (1) so there would be no guarantee that the correct underlyer had been accessed thus speech comprehension within this system would be an impossibility. Note: this is actually a problem English speakers deal with anyway (see 3.4.4 below). For example, if the utterance /tu/ is made there is no way to know which form of /tu/ is being discussed, except by the context; if the word is said in isolation it could be *to*, *too* or *two*.[34]
- **Spelling:** The speaker would be able to spell both forms because they would be the underlying forms that had been learned (i.e. the primary system).
- **Reading:** The speaker would not be able to read either *moral* or *morality* as the stress assignment is unknown so there is no way to predict whether the lax vowel or schwa should be used at (2).



[34] Interestingly (and totally anecdotally) when I was a child, my grandfather said that he knew something that could be said, but could not be written down. The words have been with me since then and to some extent are a ghost in this thesis. The sentence was: 'there are three forms of the word [tu]'. Perhaps he would have written this thesis had he gone to university…

What is available:

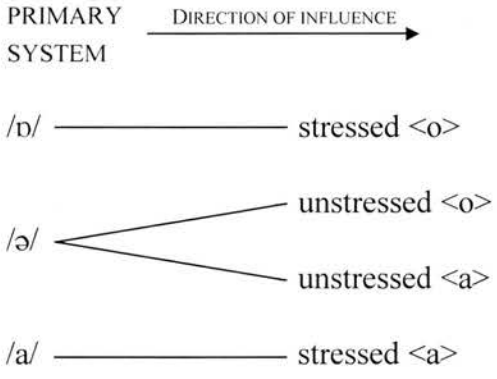


PROBLEM: information needed for decision making is only available after the decision is made.

The orthographically based system is little better than the phonologically based one, although it does capture the need to learn the spellings and that the phonology corresponds to (and is the product of) orthographic information. The overall weakness of this system though is quite startling. The model does not predict speech ability, speech comprehension, or reading ability. It only predicts that the speaker would know how to spell words. As a language system it is therefore of no use whatsoever.

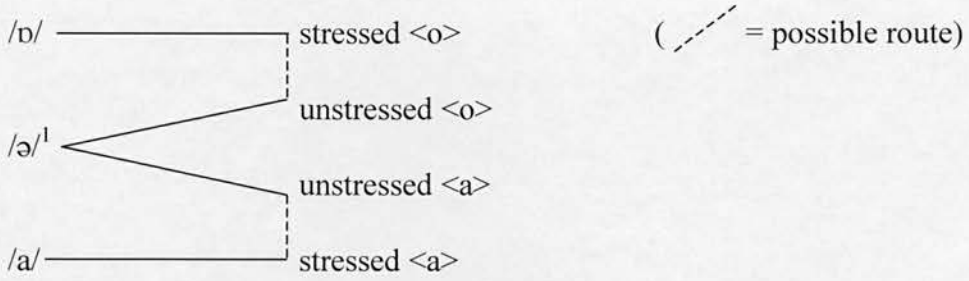
3.4.3 Phonological Primacy with derived orthography (stress assigned on the basis of orthography representation).

The second possibility for a phonologically primary system is a model which has phonological primacy but has the stress in this case assigned to the orthography.[35] But does this give the phonology its supposed rightful position while accounting for the facts?



[35] Orthographic stress possibilities will be dealt with in 3.5 below.

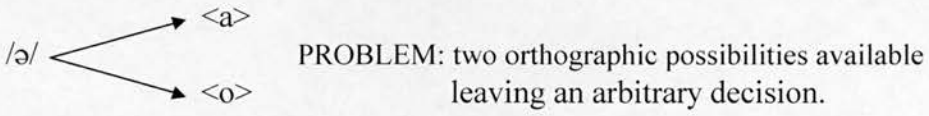
Unfortunately not. Again in this diagram the primacy phonology does not capture the need to correctly learn the spelling, although on the beneficial side the left-hand side is no longer over specified and the right side is no longer underdetermined. So what does this mean for this model with regard to the processes?



- **Speech:** Again based on the assumption a speaker utilising this system knew the pronunciation *moral,* he would be unable to produce *morality* as the schwa at (1) could pertain to either unstressed <o> or unstressed <a>. As there is nothing to dictate which orthographic route should be chosen (as the orthography is derived from the phonology) the speaker cannot ascertain whether the full vowel in *morality* is to be /ɒ/ or /a/ by the return route - based on the orthographic information and stress.

  What is required:
  Awareness of the non-arbitrary spelling of the morpheme {moral} to allow the correct full vowel to be produced.

  What is available:



- **Speech Comprehension:** This speaker would be able to comprehend both *moral* and *morality* when spoken, although they would never be able to relate the two forms at a morphemic level. All speech would be accessible as the phonology is the underlying system and the comprehension of speech would directly access this area.

- **Spelling:** The speaker will be unable to spell as the schwa at (1) could be spelled either as <o> or <a> with no clue as to which is the correct form.

  What is required:

  Awareness of the non-arbitrary spelling of the morpheme {moral} to allow the correct full vowel to be produced.

  What is available:

  /ə/ → <a>
  /ə/ → <o>

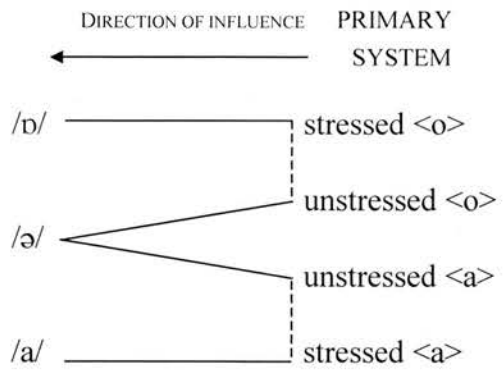
  PROBLEM: multiple orthographic possibilities provoke an arbitrary decision.

- **Reading:** This speaker would be able to read (if reading could exist in this language considering the limitations on producing correct spelling) because standard stress rules would dictate which syllables should be stressed. As the movement would be from right to left, stress assignment would select the required output as the stress information is assigned to the orthography. Reading, therefore, would be a possibility for this speaker for both *moral* and *morality*.

Some ground is gained here, but again at the expense of other areas. Reading is a possibility within this system, although this would be of little use if the pronunciation is beyond computation. This obviously is not the solution to the problem either – although it is the last option for phonological primacy.

3.4.4 Orthographic Primacy with derived phonology (stress assigned on the basis of orthography representation).

The only possibility remaining is to have orthographic Primacy with the stress assigned at an orthographic level. The phonology in this solution is predicted by the Orthography and phonemes are related to specific graphs (belonging to word spellings which must be learned):



What could a speaker with such a system do with regard to the four operations under discussion? Has anything been gained and does it predict anything more accurately?

- **Speech:** This speaker would be able to pronounce both the *moral* and *morality* forms because stress rules dictate which syllables are stressed and as the underlyer contains the information regarding each vowel graph and its possible stress determined phonological realisations, the speaker will be able to produce correct pronunciations. This model also holds an explanation of the <petal> → <petallic> productivity. When the stress shifts due to the *-ic* affix, the system knows that now it is stressed <a> which is relevant and stressed <a> is pronounced /a/.
- **Speech Comprehension:** As noted in 3.4.2 above, under a strict implementation of the argumentation, this speaker would not be able to comprehend speech. However if the situation is considered for a moment it appears that the diagram above actually predicts what occurs in English in reality. Recall the Norwegian speaker (section 3.2.3 above) who gave the form */pətɔlɪk/ for <petallic>. The reason for this is that he (and every other speaker of English when confronted by any word with a schwa in it) did not know the spelling and so did not know how he would pronounce the relevant syllable when the affixation process shifted the stress. If the

correct pronunciation is to be found, a speaker must confirm the spelling if they are to guarantee the correct morphologically complex pronunciation. Good guesses can be made in this sort of case, but they are just that: guesses. So the above diagram correctly predicts the reality with regard to our comprehension of words. Obviously the mechanism is more complex than one in which all segments must be accounted for exactly as the underlyers are, otherwise we could not comprehend speech in any but the most formal of speech situations. The model predicts the reality of the situation though: we can comprehend a given word, but we don't really know it until we know how to spell it (see Nathan (3.2.1) above).

- **Spelling:** This speaker would be able to spell both forms as the information is the underlying form and has to be learned. Also, as all variants of a given morpheme share the same spelling, the speaker can relate different instances of a given spelling and associate them with one morpheme through the common spelling.
- **Reading:** The speaker would also be able to read as the stress information dictates correct pronunciation of any of the given graphs.

This solution therefore appears to account for the way English actually functions. More relevant than this though, the other options have been extensively examined to see if they could be possible solutions and they simply just will not work, which leaves us with the solution that orthography is primary with the phonology derived from it, which (coincidentally?) ties in well with the developmental side of the issue as discussed in the previous chapter.

So is this really a possibility? There seems no reason why not. Consider the phoneme and the grapheme within the brain. Both are ultimately no more than links between neurons. It is not the case that a sound wave and a physical written form

exist in the brain, with both probably stored in much the same way. Consider an analogy with computer storage. A video file, a sound file and a word processor document, despite their very different realisations on the computer, are all stored on the hard disk as binary code that consists of nothing more than zeros and ones. An individual file's uniqueness is sterilised by the storage. Is there any reason the brain does not do the same thing in storing information? And if it does, will there be any limitation in linking the information in its most obvious and economical way? There is no reason why orthography should not hold primacy over phonology.

The solution at first seems to defy the 'obvious facts', i.e. that phonology would seem to be the primary system, but on reflection the concept is not so difficult to imagine. To recapitulate the points which led to this solution:

- Alphabetic orthography is needed to establish the existence of phonemes.
- Phonemes and orthographic units must be related.
- The setup of the relationship at its inception will logically follow the most economic pattern.
- Orthography becomes the logical underlying system as this allows the most economical and productive method of mapping a system which does not display biuniqueness.
- The whole system crucially depends on the morphology binding the system together.

3.5 Stress and Orthographic Underlyers.

One of the most difficult aspects of the theory to both grasp and justify is the concept of stress applying to the orthography, but it is the inescapable conclusion which must be drawn from the above discussion. The difficulty is that as phonologists (and linguists) we are used to assigning stress to phonological strings and not orthographic ones. However, when we consider the construction of an orthographic string, it becomes evident that there are spelling conventions, i.e. devices such as final <e>, which reflect vowel quality rather than having any phonological value. Awareness of such conventions allows access to the number of syllables in the word, the peaks of

which are represented by vowel graphs not functioning as markers. In the case of an example such as *Neptune*, the literate speaker of English knows the final <e> is a marker, and can ascertain that there are only two peaks, making it a disyllabic word. The issue of syllable number though is less likely to court controversy than the more problematic issue of which of the syllables are to be stressed, although if the number of syllables is known and the construction of the syllables, then the possibility of stressing the orthographic forms does not seem so outlandish.

From the perspective of an orthographically based theory, the stress rules which are applied to phonological forms are a somewhat problematic issue. There is the problem of accounting for why *camera* is not [kəˈmiːrə], following the stress pattern for *aroma*, or vice versa. Perhaps the most fundamental question though is whether or not *aroma* has penultimate stress because it has a two-X melody (heavy penultimate syllable), or if it has a two-X melody because it is stressed. There is no reason for *aroma* and *camera* to have different stress patterns, except that they happen to be stressed the way they are. Both have a very similar orthographic construction: <(C)VCVCV>, with nothing to dictate the stress pattern from the underlying orthographic string. So how can the speaker know the stress pattern for any given word? What is required is some means of establishing which of the two forms shows standard stress and which is likely to be considered non-standard.

Consider the following examples and their stress patterns:[36]

(1)	(2)	(3)
agenda	*aroma*	*pedestal*
pentathlon	*angina*	*camera*
enigma	*Geneva*	

[36] All examples in this section are taken from Giegerich (1992b) chapter 7 (179-207).

Column (1) has penultimate stress because the consonant clusters at the interface between the penultimate and final syllables do not allow the whole cluster to be syllabified into the onset of the final syllable[37] due to phonotactic constraints. The resultant syllabification therefore is:

a.gen.da
pen.tath.lon
e.nig.ma

As a result of this syllabification the stress falls on the heavy penultimate syllable in *agenda* and *enigma*, and on the penultimate syllable in *pentathlon* because it is the likely place to stress a noun (the only reason for the penultimate stress in this example, considering the final syllable is VC and is thus considered heavy). Likewise in column (b) the stress is penultimate due to the heavy syllable, although in this case the heaviness is due to the long vowel in the penultimate syllable and the light final syllables in each case. The examples in column C are assumed to have light penultimate syllables due to the syllabification caused by the Maximal Onset Principle:

pe.de.stal
ca.me.ra

This causes the stress to fall on the initial syllable as none of the syllables in the word are heavy, so the stress is assigned to the leftmost syllable, whether it is light or not. These examples show what would be considered a standard phonological approach to stress assignment.

The examples show a reasonable and fairly predictable stress system. However, there is the question of what the normal speaker of English (who has not studied the stress placement norms of the language) can really be said to know about word stress, as opposed to *a* word's stress. Consider the following examples:

[37] Following the Maximal Onset Principle,

(1) *tomato camel salami marina cola*
(2) *cadet canal gazette ellipse august artiste*
(3) *badminton calendar cylinder*
(4) *obey atone baptise obscene absurd intervene*
(5) *digest escort survey torment convict*

Arguments against stress applying to orthography cannot deny that literate individuals encounter written forms of words frequently, which they have not previously encountered. It must therefore be assumed that the speaker makes some kind of general stress judgement based on the information at hand (and, by default, based on the above model, some kind of vowel quality judgement). This must be assumed to be the case as there is not always a marker, such as the double <ll> in *vanilla*, to predict which syllable should be stressed. What the above list of examples shows is that the speaker cannot be assumed to know a great deal about how to stress a word, short of some generalisations concerning word stress. Consider rows (1) and (2). Row (1) shows the most standard stress pattern for nouns in English: penultimate stress. Row (2) shows nouns with final stress, which must be considered to be a non-standard stress pattern, yet neither stress pattern is reflected in the orthography. It is worth noting that nouns which do have final stress belong to a limited subgroup for nouns, in which the members are 'comparatively rare in English…[and are mainly] uncommon loan words' Giegerich (1992b: 184). Row (3) contains nouns that meet the criteria for more standard stress in that their penultimate syllables are heavy yet they have antepenultimate stress. Row (4) shows the stress pattern tendency for verbs and adjectives: final stress. Finally row (5) shows words which require us to know which syntactic category the word belongs to for correct stress placement as they are the orthographic forms of words which can be either nouns or verbs. Altogether these examples give a problematic picture for both the orthographic stress rule developer and the average literate speaker. In short, the speaker cannot be said to know anything about a word's stress until the stress pattern of a newly encountered written form is corroborated or corrected by some external source.

So what can be said about general principles of word stress based on this (albeit simplistic) set of examples? There are two things which can be established: firstly, with any newly encountered word a speaker can only make a best guess at its correct stress pattern, based on the word shape, the context and the spelling to pronunciation norms; and that this best guess will be a Spelling Pronunciation which will be assumed correct by the speaker until proven otherwise. Secondly, we can ascertain that the likely best guess for the literate is to assume primary stress defaults as follows: penultimate stress for nouns,[38] and final stress in verbs. These stress patterns are the 'best guess' for the speaker as they will apply to most words in the language - note: they will also predict the vowel quality patterns we would expect in Spelling Pronunciations as in [ˌdɪplə'do:kəs] as opposed to [dɪ'plɔdəkəs] (*diplodocus*). Also, that a speaker is more likely to produce ['kadət] for *cadet* and ['kanəl] for *canal* when they are first encountered reinforces the possibility of this default stress pattern.

3.5.1 Blocking and Spelling Pronunciations.

There are of course implications for words which do not follow the standard pattern in that every word which does not fit the stress pattern would be required to be marked as having non-standard stress by the speaker when they discovered through whatever means that the stress was not default. In other words, any pronunciation which did not adhere to the system of default stress rules with the resultant production of a Spelling Pronunciation, would have to be marked, with this pronunciation blocking[39] the default production of a Spelling Pronunciation. This

[38] Although this stress pattern is being suggested as a kind of basic non-learned automatic assumption on default stress, there are other scholars who would suggest that initial stress is in fact the default for English (cf. McCully Forthcoming).

[39] Blocking as it applies here means that a marked pronunciation (which does not follow the basic conventions of stress and/or letter-to-sound rules) is used by the speaker instead of a default pronunciation. This would be conscious on the part of the speaker, and would involve them blocking their default mechanisms for a pronunciation with a fixed marked pronunciation.

idea is the inverse of the theory posited by Kerek (1976), outlined in section 1.4, which states:

> (1) the Spelling Pronunciation is introduced as a variant pronunciation of a morpheme.
> (2) the Spelling Pronunciation may partially reverse some phonological processes.
> (3) the Spelling Pronunciation begins to block the application of phonological rules.
> (4) this may lead to the loss of the other pronunciations and ultimately a restructuring of the synchronic underlyer to one in step with the orthography.

The problem with this approach is that the erosive tendency towards Spelling Pronunciation is not captured in this process. If it is assumed however that it is the Spelling Pronunciation that is being blocked by an alternative pronunciation for the literate speaker, then the default is to produce a Spelling Pronunciation. Viewing the situation form this perspective more accurately captures what is occurring in the pronunciations the literate produces for words they have seen written but have not heard pronounced. Considering the stress patterns of examples such as *badminton* and *cinema* this is not an unlikely scenario.

This approach dictates that examples such as *aroma* could be considered to be stressed and pronounced by default, while *camera* could be considered to be marked for stress, blocking the production of the Spelling Pronunciation [kəˈmiːrə]. Considering the total inability of the naïve speaker to produce [ʃɔn] from *Sean*, this blocking hypothesis would appear be the correct - after all *Sean* might as well be spelt *Fran* for all that the spelling-to-pronunciation rules predict the pronunciation. Overall, such an approach would allow very simple stress rules to apply to orthographic strings at either a reading or underlying level. But can such a position be justified?

3.5.2 Motivations for default stress rules.

To assume such stress defaults is not in itself a strong enough position to state that orthographic forms can be stressed though. If, however, there is evidence that such a

pattern is the tendency for stress assignment, then stress rules could apply to orthography in this basic manner, working on the principle that the speaker can ascertain the number of syllables in a word and then assign the basic stress pattern to produce a phonological form (a Spelling Pronunciation), based on further defining criteria such as word class, etc. The speaker would ultimately need to corroborate whether or not the pronunciation produced through this default stress was correct, but overall the system would be neat and efficient as a method of reading new words and could be just as effectively utilised with orthographic underlyers.[40]

There are various studies which have examined the nature of stress as it affects nouns, all of which suggest that penultimate stress is the most natural stress pattern for nouns. Giegerich (1992b: 184) observes that although 'verbs and adjectives with final stress are common, nouns with that stress pattern are somewhat exceptional'. Also noted is the necessity of knowing the syntactic category for stress placement. These two factors help in the definition of possible default rules. Wiese (1996: 107) also suggests their is some kind of standard stress pattern for nouns, observing for German nouns that 'a final sequence consisting of a stressed syllable plus a schwa syllable is obeyed almost without exception'. However, in an orthographically based system these can only be seen as descriptive views of stress, because the theory predicts that the stress pattern dictates the vowel quality, rather than the vowel quality attracting the stress. What is required is a more motivational reason behind default penultimate stress.

Hyman (1975: 209) gives the following explanation regarding the naturalness of penultimate stress. The motivation comes from the perceptual salience of falling pitch over rising pitch and the association of a falling pitch contour with underlying

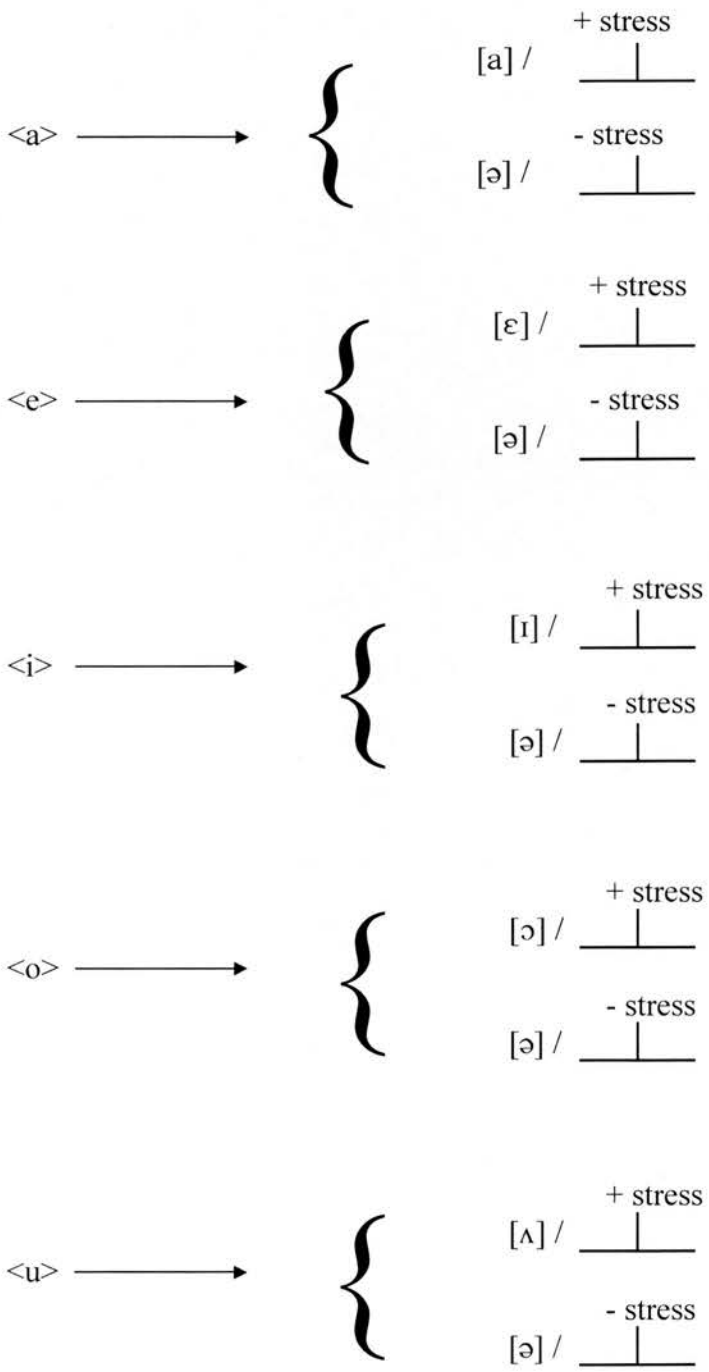
[40] Words which did not have default stress would require marking in the orthographic lexical representation, in order that they could block a Spelling Pronunciation. In other words, for non-default stress the stress pattern would be part of the underlyer as this is the only way in which the speaker could correctly stress the word. This must be the means of storage for final stressed nouns such as *canal* just now. If marking were not utilised then there would be nothing to block *canal* from being pronounced in the same way as *camel*.

stress. Hyman's discussion observes that monosyllabic forms such as *boy* and *girl* involve a falling pitch rather than a rising pitch. The logical extension of this is that over two syllables this same pattern will be favoured and as falling pitch over two syllables involves less articulatory effort than in a single syllable, the stress will be more natural in the penultimate position in the word. The motivation for the stress pattern then is one of perceptual prominence with maximised differentiation occurring if the penultimate syllable is stressed and the final syllable is not. On the basis of this, Hyman states: 'Thus, a rule which assigns penultimate stress is more natural from a phonetic point of view' (1975: 210). The inverse of this position, rising pitch therefore will account for the tendency in stress pattern for the verbs, with the argumentation following the same lines but with an end goal which prefers a stressed final syllable.

On the basis of this naturalness of stress placement, the development of simple default stress rules, and the application of stress to orthography becomes a possibility. The orthographic underlyer will be interpreted in terms of which parts are markers and which have phonological correlates. The number of syllables can be ascertained and the stress assigned to the form to produce a phonological form. The stress rules will work by default across the whole orthographic lexicon, except to those cases that are marked for non-standard stress and block production of a Spelling Pronunciation. The position therefore is one which puts stress rules into a very simplified framework in that they apply everywhere except where the speaker has had to consciously note the stress is not default. The only unpalatable problem for the hypothesis is that well known words, such as *America,* have to be marked as having antepenultimate stress, to block the pronunciation [ˌaməˈraɪkə]. But can it really be said with any level of assurance that if *America* was a less well known word that a literate speaker who encountered it in writing would not produce the Spelling Pronunciation? *Diplodocus* would suggest this is likely to be the case.

3.6.0 The Solution to the Problem of the Lax Vowels and Schwa.

Returning now to the discussion in 3.4.0 - 3.4.4 above, what generalisation can be drawn? The exemplification in the discussion examines the concept using only the *moral~morality* forms for exemplification, although the principle is the same for the whole lax vowel set. At this point, to account for the whole lax vowel group, the following rule set is required:



In applying these rules to the relevant environments the correct vowel qualities are accounted for in the alternating forms, but more relevantly the productivity is still accounted for adequately (and hopefully more accurately).

3.7 Free Rides, Productivity and Underlyer Intuitions.

It is worthwhile in light of the possible solution to revisit some of the studies discussed as evidence for the orthography/phonology relationship above to further examine the issues to establish whether or not the new solution proves better than the ways in which the issues were previously resolved. As was noted in section 3.2.3 some theories posit a situation whereby vowels undergo Free Rides to attain the correct surface vowel quality. The problem is that by definition a Free Ride is a situation where a non-alternating underlying form undergoes a rule application - which has been introduced to deal with alternating forms - *only* for the correct surface output to be attained. An example of this would be to assume an underlying full vowel in the first syllable of *about*. This full vowel is reduced in every instance of the morpheme (underlying /abaʊt/ through vowel reduction in the unstressed syllable would *always* becomes surface /əbaʊt/). Obviously this situation is uneconomical, unrepresentative at the level of psychological reality, and should not exist in any theory. In Lexical Phonology and SPE one of the solutions to avoid these Free Rides involves underlyers that utilise a mysterious and undefined V vowel. But this side-steps the issue without addressing it (as is noted in Giegerich (1992a)). The reason this is seen as relatively acceptable though is because a solution which involves the Free Rides is considered to be more unpalatable than the V solution which does not involve full vowel underlyers which never surface. Neither is particularly attractive though. The problem requires involvement of orthographic information at some level. The first solution ignores the whole issue of which vowel would appear in the schwa slots through application of the arbitrary vowel 'V' to all

unalternating instances of schwa; which removes the necessity to admit a role for the orthography. The second solution does utilise the orthography in an inadvertent way[41] to give a non-arbitrary full vowel in the underlyer but an arbitrary all-occurrence-vowel-reduction requirement to ensure the correct surface form is achieved.

However, if we apply the new rule to non-alternating forms the correct surface vowels are still maintained (schwa) while the underlying orthographic form still holds information for both writing the word down as well as the information needed for a full vowel if one is ever needed. So the rule predicts that *about* will always surface with an initial schwa as dictated by the stress assignment and that the <a> in *petal* and *petallic* is always the correct quality as dictated by the stress. The cruciality of the spelling in this operation is highlighted (in 3.2.3 above) by the Norwegian speaker's inability to perform this without the relevant spelling information. If the underlying forms for this set are orthographic they will always generate the correct phonological segment as is determined by the stress and the whole operation is non-arbitrary and economical. The underlying segment does not involve change from one phoneme to another in a generative fashion, rather instead the surface phoneme is the representation the underlyer generates, or manifests itself as, as is dictated by the stress.

The examples given by Taft and Hambly (1985) above involving non-alternating forms such as *lagoon* are perhaps the most convincing examples to reinforce the position of the proposed solution. As was discussed previously, speakers intuitively feel that full vowels appear where in reality schwa appears, e.g. it is thought that the first syllable of *lagoon* is /lag/ not /ləg/. The question is why does the speaker think this is the case? Why should the speaker assume that /lag/ is the

[41] Inadvertent because surely any of the lax vowels could appear in this position unless there is some aspect which dictates that this vowel is more likely than the others. Of course the selected vowel is more likely, but this is due entirely to the orthographic information.

initial syllable? If the relevant part of the suggested set of rules is examined a possible answer to this is evident:

In *lagoon* the stress falls on the final syllable. The word is non-alternating so the first syllable is always schwa. The above rule predicts this initial schwa in the context of the word *lagoon* (as surely the double <oo> predict the /u/ phoneme and the stress pattern for this word - *blood* and *flood* being marked for pronunciation, cf. *food*, *cool*, *yahoo*, etc.). So why is the first syllable subconsciously thought to be /lag/?

The proposed underlying form for this word is <lagoon>. When the first syllable is isolated from the word it becomes a monosyllable with the underlying construction <lag>. All lexical monosyllables are by default stressed. The forms /lag/ therefore is not misinterpreted by the subjects of Taft and Hambly's study as the first syllable of *lagoon*, it <u>is</u> the first syllable of *lagoon* if the underlyer of *lagoon* is broken into two syllables, with stress applied to the first syllable. In other words: in the context of the word *lagoon*, <lag> is unstressed due to standard syllabification norms and stress considerations, so the vowel is manifested as schwa. But when <lag> is placed in a monosyllable the rule predicts that the *same underlying string* will have the full vowel /a/. Thus when the question 'does /lag/ appear in *lagoon*?' is asked the subject will automatically extrapolate that the phonological string suggested corresponds to the orthographic information <lag> (how else would we want to spell /lag/? cf. Nathan (1979)) which corresponds to the first part of the underlying <lagoon>. The phonology misleads Taft and Hambly to conclude underlying full vowels based on the orthography whereas perhaps a more accurate description of what is occurring here is captured in the above rules and is again

predictable by stress: the orthography in the suggested context is manifested as a full vowel in the monosyllable (by default) whereas in the context of *lagoon* it is schwa. The rule economically predicts that the outcome from Taft & Hambly will occur.

3.8.0 Historical Problems...

The question is: what happened to allow the orthography this dominant position? For the majority of linguists and even for native speakers of English an orthographically dominated system seems an unlikely reality at best as well as seeming intuitively wrong, given that speech pre-dates writing. The discussion above logically eliminates all other possibilities and shows the solution to be the only solution to predict the situation that exists in English; although, some of the more prominent questions thrown up by our reflex intuitions against orthographic primacy should be examined here.

3.8.1 The Chicken and the Egg: a brief history of written language.

One of the first questions which must be answered if the above theory is in any way to be accepted is the chicken and egg question: if orthography gives rise to phonology how can it be explained that writing developed in an alphabetical way when it is necessary that alphabetic orthography requires an understanding of phonological segments to give values to the individual graphemes? In other words, how can it be denied that an awareness of phonemes is needed to develop alphabetical writing? A brief examination of the evolution of the alphabet from its Egyptian origins explains a great deal with regard to this issue.

Halliday (1985) is primarily concerned with the differences between written and spoken language. Fortunately for this thesis, he devotes a whole chapter to written language and its development. The following history is a reflection of the

major influences on the development of the alphabet as they appear in Halliday (1985).

Writing developed in three different parts of the world:[42] south-west Asia and North-east Africa (Sumeria and Egypt), in China, and in Central American (the Mayans). The alphabet used by the English language is a descendant of the Egyptian writing system. Egyptian writing was a 'charactery' called 'hieroglyphs' meaning 'sacred carvings'. One of the crucial development characteristics of hieroglyphs was a process known as 'Phonetic Transfer' which occurred around the third millennium BC. Phonetic Transfer is where a homonym of a word takes the same written form as a word which shares the same pronunciation and already has a visual symbol assigned to it, e.g. using a present day English example all forms of the word /tu/ would share one symbol even although they have different functions. In other words the visual aspect of writing becomes independent of the semantics: the image was a representation of the sound of the word rather than specifically a picture to represent the word. As Egyptian had polysyllabic words there occurred syllabic construction of polysyllabic words using other smaller words. For example, *khesteb* 'tortoise' shared the sounds of *khes* 'to stop' and *teb* 'a pig'; which allowed the written form 'tortoise' to be represented by the symbols for 'to stop' + 'a pig' - even although the words are not related to 'tortoise'. Note that this system works at a syllabic rather than morphemic level, i.e. the original values of the constituent morphemes are not relevant in the new environment, but rather the sounds are paramount. This step is, according to Halliday, the fundamental transformation of the nature of the writing system: the *function* of the symbol had changed from representing a word to representing a sound unit (in the case of Egyptian, the syllable). Obviously this kind of writing is not problematic for the theory outlined above and in the previous

[42] It is assumed that this development of writing occurred independently in each of the areas, although recent theoreticians suggest there was an advanced sea-faring superculture who introduced many ideas throughout the world (Hancock and Faiia (1998)).

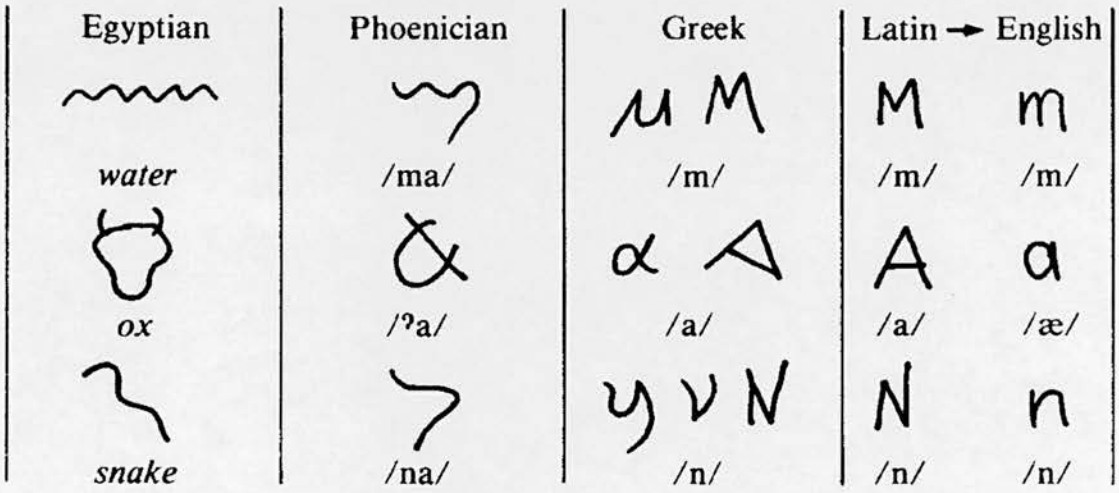
chapter because syllables are understood by pre-literate as well as literate speakers, and as such there is no need to delve into the phonological aspects. However, the alphabet obviously has developed since then and with it a more refined representation of phonological information.

The next step in the evolution of the alphabet involved the Phoenician use of the Egyptian writing system. The Phoenicians borrowed the Egyptian alphabet to represent their Semitic language. They borrowed around 30 of the Egyptian characters, using those characters with the relevant words in their language. The characters were named and came to represent the syllable of the words they were named as, e.g. the Egyptian 'ox' character became associated with the Phoenician word for ox '?aleph' and the character became associated in the writing system with the syllable /?a/ and more specifically with the glottal stop element. Phoenician did not represent vowels in the writing, as modern Arabic and Hebrew also do not in the present day, because of the predictable nature of the vowel qualities. The syllabary therefore reflected the relevant initial consonantal elements within a syllabic environment. In effect the Phoenicians had established the consonantal aspect of the alphabet. The other aspect the Phoenicians gave to the alphabet was the concept of a specific order for the alphabet. So, in short, by the end of the Phoenician influence the alphabet had become 30 syllabic characters each representing a different initial sound, the order of which was always fixed when listed.

The next people to borrow then influence the alphabet were the Greeks, who manipulated the alphabet to reflect a concrete representation of vowels as well as consonants. The Greeks required a representation of vowels as well as consonants because in Greek, vowels are not predictable occurrences, so representation of vowels became a relevant issue. The Greeks took the Phoenician alphabet and used the first sound of each of the characters nearest to consonant sounds in their own language. The characters left over were used for vowel sounds in Greek, e.g. the

glottal stop did not exist in Greek so the symbol was adopted for the sound /a/ - incidentally this is why the alphabet begins with <a>, which is a result of the Phoenician ordering and the Greek use of the initial character for a vowel. Doubtless the spread of the vowel graphs through the alphabet is because of the Greek use of redundant symbols for vowel sounds while retaining the original Phoenician order. Other graphs were also introduced at this point for the vowels that Greek had in its inventory. The alphabet as used by the Greeks therefore became a phonemic alphabet rather than a syllabary with one sound represented by one letter. The final chapter of the history is that the Romans finally adopted the Greek system and, removing letters they did not require, used it to write Latin. This is the alphabet we use today.

So there is an evolution from a character based writing system to a system of representing sounds in words. The following example for 'man' reflects this.



Source: Halliday (1985: 24)

This evolution shows a development from charactery to syllabary to phonemic writing system as dictated by the needs of the cultures who were using the writing.

But does this totally account for the issue? In the previous chapter it was stated that there is no phonological development without alphabetic literacy, which seems problematic even after this brief history of the alphabet because the process of development of phonemic awareness is by no means automatic as the situation with

present day illiterate adults clearly shows (see 2.2.4 above). So how did the crucial step develop? The answer to this I believe is twofold: firstly, the peoples who were using writing were looking for a way to give their language permanence and writing was the solution, i.e. those cultures which required a written language for trade or for documentation spent the time to study the written language in order to develop the system. So the first aspect is that a functional writing system was relevant to their culture, which demanded that a solution was found. The second aspect involves primarily the Greeks and their inherited Phoenician alphabet and a bit of reasonable speculation. The Greeks had the consonants already available to them as the Phoenicians had organised their alphabet in terms of sounds in which the onset were the relevant information, so basically the Greeks inherited a list of consonantal sounds. These initial sounds could be broken from their rhymes by people unaware of phonemes as is discussed in Chapter 2 above. As this would leave the person with a visual correlate for a specific sound, the leap to consonantal phonemic awareness is not too far - especially considering the solution was actively being sought. Considering that teaching phonological segmentation without the alphabet is possible (Ehri (1984)), it is logical to assume that with the visual information and the relevant sound information was enough for the connection to have been made - although it would not have been easy. There is no other way to explain how the Greeks could have made the leap, while still accounting for the lack of phonological awareness in present day illiterate adults. The total length of time from the inception of writing to phonological writing is thousands of years which highlights the difficulty of this ultimate outcome for writing, which also would explain why in a person's life they are not automatically likely to develop phonemic awareness. The process required evolution of thought and ideas that necessarily were handed down through the ages. If it were a simple issue, writing systems that utilise a small number of visual symbols that can be combined to represent any word would have occurred far earlier.

The functional load of the visual aspect of such a system would have benefited any civilisation: around 30 characters of an alphabet as compared to the hundreds to tens of thousands of individual characters needed for either a syllabary or an ideography.

3.8.2 The Diachronic Primacy Inversion - a brief account.

There is one final step in the evolution of the written language that has had a great effect on English. A change has occurred since the Greeks used the alphabet. This change has been a move away from a representation of one symbol for one sound through general phonological decay caused by people's use of the language. The writing system, at its inception, was a phonological writing system (the logical way for a writing system to be constructed). However, as writing tends to be more fixed than speech a mismatch occurs over time. This mismatch means there is not a direct route from the spoken form to the written form with the result that people who want to spell correctly in the system, which is no longer phonemic, are forced to learn the arbitrary spellings of words (and morphemes). This learning of the spellings facilitates association of related alternant forms with one morphemic form: the orthography in the Morpheme Spelling Principle, which allows a system of morphologically bound alternation which accounts for and constrains the alternations, but which also has the productivity which can be seen in the *petal~petallic* example. So the final chapter of the story is that if standard spelling is to be maintained then the Phonemic Writing System becomes a Morphemic Writing System as the phonology degrades. This becomes the only way to deal with the lack of biuniqueness as the orthography is forced into the primary position as only it carries enough information to control the phonology in a non-biunique system. In effect then, what has occurred diachronically with the phonology and orthography is that a Primacy Inversion has occurred at a language level. Only through this switch in primacy can the system continue to work, the only other solution being to maintain

biuniqueness by employing a graph for every sound after changes like vowel reduction, e.g. schwa would have been assigned a specific letter, which would mean sacrificing a fixed spelling system and its benefits. The necessity of the one-spelling-to-one-morpheme principle (the Morpheme Spelling Principle) becomes the linch-pin which holds the writing system together and allows more than one sound to be assigned to a graph, but only within the context of the morpheme. In fact we find that at a morphologically constrained level the number of phonemes that can be related to a given set of graphs does not exceed three and the three are also totally predictable within the constraints of both the stress and the morphology. For example the graph <o> in {Milton} pertains to three phonemes /ə/ *Milton*, /ɒ/ *Miltonic* and /o/ *Miltonian*. However, the phonemes are all derivable from the <o> grapheme, there is no */məltɪnɪk/ form or the likes associated with the morpheme {Milton}. All variants adhere to an orthographically and morphologically bound phonemic limitation which removes the complex problem introduced by the lack of biuniqueness in English for the simple reason that at the morphological level, appealing to stress rules and affixation norms, there is still biuniqueness within the system. It is not merely just a case of biuniqueness between sound and spelling. Today, from a synchronic perspective, it is also a case of stress and context as well as spelling. From this information the majority of alternations become fully predictable in a very simple manner. Orthographic primacy, therefore, can be seen as the obvious solution to meet the necessity of the degradation.

3.8.3 How can orthography be primary when some languages have no writing system?

This is another of the most common questions fired back at a theory of orthographic primacy; and again it is a valid question. The solution to this lies in the nature of alphabetical orthography. Only alphabetical orthography has the effects described

because only the alphabetical system provokes the speaker to develop phonology. So because the non-literate language does not develop segmental phonology it will obviously not have an orthographic system as primary, it will not have an orthographic system, or a phonemic system at all. In other words: only languages which employ an alphabetic writing system and which lose biuniqueness between sounds and spellings will have an orthographic system as primary and more relevantly would require development of one. Perhaps the more relevant issue here is: how necessary is phonemic level phonology except in languages which use the alphabet, i.e. does the phonology become a linguistically relevant variable as a result of phoneme development? There is no sure way to test this hypothesis.

Overall, the literate and non-literate culture differ considerably with regard to this issue, although the issue of economy is relevant. There is a benefit to developing phonology in that it is more economical as is shown earlier in this chapter. Yet as Jaeger (1986) observes (see section 1.6), the Maoris show an abundance of redundant information with regard to passive suffixes. So is memory space really an issue, or does the fact that an illiterate speaker (or culture) must list everything (including stress?) really make any difference to a speaker? The speed at which any individual processes information would suggest not.

As concerns those who are illiterate in a literate culture there is one crucial difference in that there are obvious limitations for the illiterate speaker with regard to their ability to manipulate morphological alternations. But for languages that do not use writing (and more importantly the Morpheme Spelling System), would there even be this sort of alternation? Why should it develop in the absence of alphabetical literacy? All the alternations in English are, as has been previously stated, morphologically and orthographically bound. If the orthography did not exist, there would be no link between the sounds which would require the speaker to associate common forms; but more relevant than this, the sort of alternations might not even

exist. It would be an interesting study to ascertain whether vowel-shift changes and correlations occur in non-literate languages. Ultimately, there is no reason why any speaker should learn anything linguistic unless it is relevant to them. Another interesting aspect of a non-literate culture is the pace of change within their language, which is much faster than in one which employs literacy. Ehri (1984: 141) notes that native American Indians cannot understand the people in their villages three and four generations older because of the speed of language change. In literate languages the orthography holds the pronunciation in check, restricting the level of change which occurs.[43]

The statement regarding the primacy of orthography therefore is obviously not a universal language claim, but is rather a specific feature of languages which employ alphabetic literacy. That some languages do not use writing is therefore not relevant as this factor isolates their language from this possibility for the reasons outlined.

3.9 Conclusion.

In this chapter, the link between orthography and phonology for the literate adult was established through examination of various studies that reflect this. There has never been a great deal of doubt that this is indeed the case, as the introductory chapter shows: linguistic scholars were not denying the effect of orthography, they were just vociferously unhappy about admitting it. The endeavour here was to ascertain why orthographic interference is such a prevalent force. The primacy of the orthographic system goes a long way to explaining this.

The overall conclusion to this section is that the orthographic system helps to develop the phonological system and necessarily holds an underlying, and primary

[43] Dr. Johnson and his peers may well have achieved their goal.

position. Through this relationship the great versatility of pronunciation is achieved while there is still maintenance of a strong, non-arbitrary anchoring force in the Morpheme Spelling Principle. Orthography, in a literate society, is the primary linguistic system, from which phonological outputs are generated through basic principles in the form of Spelling Pronunciation.

Chapter 4

Orthographic Influence on Linguistic Theory.

4.0 Introduction

In the previous chapters the case for strong orthographic dominance in the processing of language has been examined, with the conclusion that the orthography plays a prominent role in the development of the literate phonological system (in languages using an alphabet). Moreover, it also plays a prominent role in the fully literate speaker's language processing, as is shown in Chapter 3.

Bearing this in mind, it is worth examining linguistic theory to see whether the orthography, which is a prominent mechanism for the authors of theories, is evident in the theories they produce. Toward this end, this chapter is an examination of Chomsky and Halle's *The Sound Pattern of English*. This theory has been chosen, as it was a groundbreaking theory when it first appeared in the 60s. More than this, its effects are still felt in the linguistic community, with various revised theories, such as Lexical Phonology, having their roots in the SPE system.

4.0.1 Orthography in SPE.

Even now, over 30 years after the first publication of SPE, there are still questions regarding its content which remain unanswered and worthy of investigation. One such question is why similarity between SPE underlyers and conventional English orthography is noted within SPE with such fervour. On inspection it becomes apparent that a large part of the observed similarity stems from the use in SPE of orthographic devices towards phonological ends (see 4.2 below). This, along with the repeated reference to the similarity between (many of) their underlyers and conventional orthography, demands that further investigation is undertaken into the

role of orthography within SPE. The first part of this section, therefore, is an examination of the references made in SPE regarding orthography. This is undertaken to establish why orthography is turned to as a source of solutions to phonological problems. The aim of this is to establish why SPE utilised aspects of, but did not commit to, a concept which would ultimately have given a far more simple and natural grammar had it been seen to its natural conclusion: namely orthography *as* underlyer instead of orthography as similar to abstract underlyer.

4.1 The SPE Observation.

> There is nothing particularly surprising about the fact that conventional orthography is a near optimal system for the lexical representation of English words. The fundamental principle of orthography is that phonetic variation is not indicated where it is predictable by general rule. Thus, stress placement and regular vowel or consonant alternations are not generally reflected. Orthography is a system designed for readers who know language, who understand sentences and therefore know the surface structures of sentences. Such readers can produce the correct phonetic forms, given the orthographic representation and the surface structure, by means of rules that they employ in producing and interpreting speech... It is therefore noteworthy, but not too surprising, that English orthography, despite its often cited inconsistencies, comes remarkably close to being an optimal orthographic system for English. (SPE : 49)

This paragraph is one of the most intriguing references to orthography to appear in SPE. As is clearly stated, the orthography is 'a near optimal system for the *lexical representation* of words'. However, even in light of this strongly suggestive viewpoint on the possible status of orthography, SPE does not choose to treat orthography forms *as* lexical representations. Instead SPE claws its way through a complex and abstract system, all the while implicitly acknowledging that orthography already achieves what they are trying to do, i.e. the position where 'phonetic variation is not indicated where it is predictable by general rule' and where a morpheme has one underlying form from which all surface variants can be derived. The most

prominent observation in the above paragraph though is the awareness that from the orthography speakers have a set of rules from which they can produce a 'correct phonetic form' (albeit by definition a Spelling Pronunciation). Considering the observed similarity it seems quite extraordinary that SPE did not treat the orthography as the lexical representations of words and generate a grammar that would divulge the spelling-to-pronunciation rules they are proposing each and every literate speaker has access to. There is also the other side of the coin: through not taking up this position SPE is forced to develop a system which can achieve this end goal by some other means, ultimately moving SPE in a direction which causes some of their most unpalatable (and also their most fundamental) solutions to the encountered problems, e.g. abstract underlyers and the rules required to manipulate them, i.e. the Vowel Shift Rule.

There are numerous references in SPE which state that the abstract morphonemic representations are similar in form to orthographic forms. The following sections examine the system employed by SPE and also those instances of observed similarity between their underlyers and the orthography to try to establish why the similarity occurs. The chapter will conclude with an examination of SPE's most central concept (the Vowel Shift Rule), after which a far simpler solution based on orthographic underlyers will be outlined.

SPE does state that 'orthography provides a natural lexical representation for a language'. Indeed, it is strange on inspection of SPE why this approach was not favoured, especially considering the repeated statements regarding the overall similarity; and also considering the views in Chomsky (1970)[1] which states '... a lexical representation ... provides a natural orthography for a person who knows a language'. Overall the SPE position leaves us with this problematic question: if orthography is so natural, why is it not considered to *be* the lexical representation?

[1] Obviously this was stated after SPE was published. But it does show that Chomksy still believed this to be true.

4.1.1 Abstract Underlyers: the motivation.

SPE utilises a system of abstract underlyers, which are underlyers which do not necessarily conform to the phonetic reality of one or all of the surface pronunciations. The impetus for this is that employment of such a system allows distinct surface pronunciations of morphemes to share the same unique underlyer from which all possible surface forms of the morpheme can be realised through a series of rules. The reason the underlyers are abstract is because of this need to encompass all variants of the surface representations and the resultant amount of information which must be carried by the underlyer; a situation which necessitates the abstractness, in that '... the lexical representation of an underlying form will be very different from the phonetic representations of its variants' (SPE: 44). The obvious beneficial side to the abstract system therefore is that forms such as *divine* and *divinity* can share the same underlyer (*divIn*), even although the vowel quality of the second syllable of each variant is different (/aɪ/ versus /ɪ/ both from SPE's underlying *I*). The conceptual premise of the abstract underlyers is therefore well motivated as it allows SPE to encompass the relatedness of morphological forms, a position which captures a reality of the language. However, there has been a great deal of criticism levelled against SPE with regard to the use of abstractness to achieve this end (cf. Jaeger discussed in 1.6). The psychological reality of abstract underlyers has been shown by Jaeger to be more than a little shaky. This then leaves the whole SPE theory in a fairly weak state considering the importance of the abstract underlyer hypothesis to the overall theory. There is also a second question regarding SPE's system though: why does SPE use orthographic devices within their system, i.e. why do orthography and orthographic devices play such a prominent role in the SPE account?

4.2 Orthographic Devices employed in SPE.

4.2.1 The *Neptune* Case: environment <-VCe>.

One of SPE's most prominent examples to conclude an underlyer of the same form as the conventional orthography involves the word *Neptune* (SPE: 45). The surface pronunciation of this is [néptUn] (using the SPE transcription conventions). The problem for SPE is that in the surface form the stress is on the first syllable which does not fit with the predictions made with regard to the heavy final syllable and the SPE Main Stress Rule (SPE: 240). The rule predicts *[neptÚn] because the final syllable is strong due to the tense vowel, which attracts the stress. To circumvent this problem SPE employs the use of a final *e* in the underlyer (neptUne) following the pattern proposed for *ellipse* and *eclipse* (SPE: 45).

In the *ellipse* and *eclipse* examples, SPE utilises a final *e* in the following way. First the possibility of a non-final *e* underlyer is examined for the two words, e.g. */Elips/* and */Eklips/*. Under the SPE Main Stress Rule the final syllable is removed from consideration if it has a simple vocalic nucleus. The stress is then assigned to the penultimate syllable of the residue if the new final syllable is weak, or to the new final syllable if it is strong. In the absence of the existence of a final *e* the Main Stress Rule predicts **/Élips/* and **/Éklips/*, both of which show incorrect stress. However, with a final *e* there is in effect a new final syllable which when the stress rule is applied yields the correct stress and pronunciation as the second syllable is heavy. Having achieved its function with regard to stress assignment the final *e* is removed by the rule e → ∅ /__ #, which tidies up both the extra non-realised final vowel while also falling into line with the 'peculiar gap' which appears in the possible set of final unstressed vowels (SPE: 45): 'there are no examples of *e* as the final vowel of the lexical representation'. Altogether this is a very contrived and complex (yet convenient) method of attaining the correct stress on the words in question - and one which heavily draws on orthographic norms.

The problem for SPE is that with the *Neptune* example even if the final *e* is added there is incorrect stress assignment because the final syllable of the residue after the removal of the actual final syllable is still heavy due to the *U*, and so it attracts the stress. The next stage of the SPE solution is the change which allows a direct *visual comparison* between the SPE transcription and conventional orthography.[2] The proposed solution is to assume a simple vocalic nucleus in the underlyer: /neptune/. This form does not have a strong final syllable in the residue, so after the final syllable is removed, the correct stress placement is achieved on the initial syllable by default. This manipulation of the lexical representation brings its own problems though. There is now the problem of incorrect vowel quality in the final phonetic syllable. This issue is addressed through introduction of the rule:

(1) u → U /__ CV

This is seen as justifiable because it not only accounts for the *Neptune* case, but because it can also be externally motivated in words such as *music*, *mutiny* and *mural*. So through remarkable mechanics, the speaker can produce the correct phonetic form of *Neptune.*

What is of greatest interest here though is that rule (1) is nothing more than a re-writing of the long/short rule for the graph <u> which children are taught in school as part of a general rule concerning vowels.[3] In other words this is a standard spelling-to-pronunciation rule that SPE has converted into a phonological rule for use within their system. The spelling rule can be (very) generally stated as:

(2) If a vowel graph <a, e, i, o> or <u> appears in a spelled form followed by a single consonant and then a final *e*, then the vowel will be pronounced with the long variant [(j)u], e.g. *tube* v. *tub*.

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[2] Note it is a visual comparison as <Neptune> yields phonological /ˈnɛpt(j)un/ for the literate, not /ˈnɛptʌnə/ which the SPE underlyer becomes when we convert it to IPA symbols. Also using default stress it will be correctly stressed, with the final <e> predicting the correct second syllable vowel quality.

[3] Cf. Nathan (1979) in section 3.2.1.

This basic spelling-to-pronunciation principle is eventually extended to include all of the environments SPE notes, with blocking through consonant doubling occurring and non-application of the rule in the absence of the final <e>. It is likely that the SPE rule is lifted from the spelling system yet there is no acknowledgement that this is the case. Moreover, the final *e* which is added in SPE is really only added to be the trigger for the vowel quality of the surface vowel. If we consider for a moment the possible underlyer /neptun/, apart from the need to alter the final vowel to give the surface form, this form correctly predicts the stress based on the Main Stress Rule. Surely some rule mechanism could have been introduced to change the final vowel to the correct quality without the abstractness of the non-surfacing final *e*.

In other words the final *e* in SPE's /neptune/ only exists to give the correct vowel quality to the final syllable, or rather, SPE is exactly replicating the status of final <e> in the orthography, except that they assign it a non-surfacing phonological value which the orthography does not. In this case, SPE has manufactured an arbitrary and complex solution to what can surely be considered a logical interpretation of the word's spelling, a spelling pronunciation. It is evident how contrived the situation is when we consider how someone reading the word for the first time would interpret it, namely they can get from <Neptune> to /ˈnɛptjun/ simply, as both the vowel quality of the first and second syllable are predicted by the spelling and default stress assigned to the penultimate syllable - a very straight-forward interpretation. Compare this with the SPE journey from /nɛptʌne/ to /ˈnɛptjun/ which is altogether more complicated and unlikely. In short, in the case of *Neptune*, SPE is extremely contrived.[4] Also worth noting is that *<Neptun> would not be as likely to have the full vowel in the second syllable as when the final <e> is included. <*Neptun> is more likely to produce either /ˈnɛptən/ or /ˈnɛptʌn/, which

[4] Strangely *reptile* follows the same pattern as *Neptune*, yet SPE does not draw the comparison between the two.

highlights the sort of information carried in spelled forms, which is available to produce a Spelling Pronunciation, and which SPE is utilising in this example.

4.2.2 Consonant Doubling, Final *e* and Underlyer Manipulation.

Another orthographic device used in SPE is consonant doubling. One way in which doubling is used is to block the above tensing rule. SPE (46-47) states that the reason *cunning*, *mussel* and *currency* do not have the [U] vowel is due to a doubling of the consonants in the underlyer. Again this device is lifted straight from spelling-to-pronunciation norms with the result that the SPE underlyer is a reflection of the orthography. As with the previous rule, once again there is the requirement of a secondary correction rule to rectify the gemination problems created by use of the orthographic device. In this case a rule that deletes the second instance of any doubled consonants in the phonology to give the correct surface form. The rule is as follows:

(3) $C \rightarrow \emptyset$ / __ *identical consonant*

This example of blocking through doubling is a crude reflection of the spelling to pronunciation rules utilised in the orthography, e.g the double consonant will dictate which rules apply to the vowels, or as in the above cases which rules will not. This highlights the unprecedented similarity between SPE and the standard spelling-to-pronunciation rules. This leads to a rather peculiar position as regards SPE: is SPE based on the spelling system and the rules needed for pronunciation without being aware that this is what it is? The more SPE is examined, the more apparent it becomes that it can be interpreted as a representation of the rules employed by the literate; a position which is astounding because it suggests that Generative Phonology, which is debatably the most fundamental phonological theory of the latter half of the 20th century, appears to be fundamentally based on the spelling system.

The striking use of orthographic devices though leaves little doubt that the method of achieving the surface forms from underlyers is derived from spelling. One fatal error exists in SPE, though, and that is the lack of acknowledgement of the synchronic values of the written forms: not every graph has a phonological correlate in the orthography form, a situation the literate automatically deals with, but which causes SPE to posit a number of rules to deal with the problems this causes. Although it is worth noting, this problematic aspect is a theory internal problem generated by SPE's dogmatic adherence to its own set of internal rules.

Use of doubling for blocking purposes is not the only use of doubling in SPE. It is also used - along with the final *e* - as a (contrived) method to make syllables heavy so they will attract stress. Or to state it more clearly, SPE uses doubling to try to account for those words which do not fall within the norms of their standard stress placement rules. This is a relevant point to make as the stress placement on some of their non-standard stressed words does in fact fall within standard stress norms of English if we do not use their system. For example, *vanilla* would be stressed in an orthographically based system as the double <ll> tells us the syllable is stressed (in reality the very aspect SPE is trying to capture). Besides in *vanilla* the penultimate syllable is stressed by default stress. It is worthy of note that words such as *vanilla*, *Madonna*, *rubella*, etc. were borrowed from languages which had a geminate in the phonology which is reflected as a double graph in the spelling. The stress pattern was borrowed along with the word and remains intact even although the geminate has been removed as English does not have geminate consonants. What does this say about the stress? Nothing except that by default, in these examples, it falls in with standard stress patterns and this is coincidental with the orthography of these words and the pronunciation of such orthographic norms.

This then begs the question of why SPE does not merely mark those forms that are irregular as irregular, rather than create a set of rules or an amalgamated

underlyer based on spelling norms to account for the irregularity? SPE argues against such an option in a section on non-standard stress (SPE: 145-146). The possibility of marking for nouns is discarded as they say it would involve the feature [± regular] being added to every lexical matrix for nouns; an addition which would create massive redundancy for those items which will be [+ regular] making this a non-viable solution. Yet surely in the case of the feature [± regular] the norm should not be required to be marked as the norm, but rather only abnormalities marked as such. On closer inspection we find it is only with regard to nouns that this argument is used in SPE. Concerning verbs SPE states:

> The feature composition of a particular lexical entry is not a matter of choice but rather one of fact ... each non-regular lexical entry must indicate exactly which rules do or do not apply to the item in question. The discovery of non-regular verbs, however does not force us to provide such additional specification for the regular verbs. (SPE: 146)

So why should this be the case for nouns? It seems peculiar that the same system could not be employed with the nouns, yet SPE rejects the possibility in favour of underlyer manipulation to pull the irregular forms into line with their rules - a solution which is at best arbitrary. This is a recurrently problematic aspect in SPE. It is constrained by its own internal workings in some areas yet in others has a completely free hand to address problems on the most sketchy motivations - the manipulation of the underlyers is ultimately made on the basis that in comparison to a solution involving addition of a special feature it 'involves no such complication and is therefore preferable' (SPE: 147). Not only is there a lack of consistency to the account, but also each of the solutions to deal with irregularity seems glaringly incorrect when removed from the pages of SPE. Regardless of this apparently weak motivation, the decision to adapt underlyers to fit the system is taken, rather than vice versa.

SPE utilises the orthographic norms in what can only be described a 'stretched to fit' manner. This is as true for doubling as it is for use of final *e*.[5] SPE sacrifices regularity of lexical representation in favour of regularity of their rules through manipulation of underlyers using orthographic norms:

> ...the best way to deal with exceptions is to modify their representations in some *ad hoc* way so as to enable them to fall under the general rules, which can then remain unaltered in their simplest and most general form. (SPE: 87)

In other words the theoretical rules constructed in SPE are paramount for Chomsky and Halle, which reinforces the arbitrariness of SPE. It is also worth noting at this point the following statement made with regard to underlyers:

> It is a widely confirmed empirical fact that underlying representations are fairly resistant to historical change...if this statement is true, then the same system of representation for underlying forms will be found over long stretches of space and time. (SPE: 49)

A problem? Surely they cannot subscribe to both views. They must be aware that to manipulate an underlyer to fit their theory goes against the 'empirical facts' regarding the resistance of the underlyers to historical change. Or are they saying the underlyers have always been this way? Overall, this is a contradiction SPE is content to ignore.

Examples of words modified to fit the SPE rules are *burlesque*, *ellipse* and *cement*, all of which show non-standard stress (SPE: 147). As the motivation and SPE solution for *ellipse* is discussed above it will not be repeated here (*burlesque* follows the same pattern). The solution for *cement* on the other hand is worth brief discussion as it is both arbitrary and abstract. It is suggested (SPE: 148) that there is a final *e* in the underlying representation of *cement*, /sEmente/ - the final *e* they have added is ignored for stress purposes (as it is with *ellipse*, etc.), causing the stress to fall on the new final syllable giving the correct surface pronunciation. However, they

[5] It is interesting that (SPE: 148) describes the use of these devices as 'artifice' as in many of the cases the unlikelihood of anyone having such a lexical entry is remote at best, highlighting the artificial nature of the solution and its theory specific nature.

note in a footnote that not to have the final *e* (/sEment/) would put the stress on the first syllable which they note *is a dialectal variant.*[6] The final *e* is removed later by the e → ∅ /__ # to give the correct disyllabic surface form. This solution to the non-standard stress is obviously unsatisfactory for reasons of excessive abstractness and because it violates the cited empirical facts about underlyers. Probably most concerning is the arbitrary use of the final *e* when it plays no other role except to predict the surface form before it is removed. Surely a less arbitrary and abstract method would be to suppose the underlyer /sVment/ where the initial syllable surely could not be stressed as it is by default the reduced vowel schwa which cannot appear in a stressed syllable? In this way the non-standard final stress would be accounted for in a less arbitrary manner, although there would be no way to account for the dialectal variant which SPE notes.[7]

The orthographic devices of doubling and final <e> are the obvious source of these SPE solutions, although how they are used here is sometimes extremely arbitrary and abstract. Considering the similarity of what is needed in the solutions, it would seem to be far more obvious to have the orthography itself as the underlying system and the simplified stress rules previously outlined, and any exceptional cases marked as such.

4.2.3 <s> voicing / V__V.

There are also instances of other orthography-to-phonology rules which have been hijacked for use in SPE. Consider the following rule from (SPE: 47):

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[6] It is worth noting here that all examples of final stress in nouns would be required to be marked in the orthographically based system in order that they block Spelling Pronunciations. Observe how the *cement* case can be interpreted as a failure of the block in the dialect SPE notes, as the stress is default penultimate and the relevant vowel is <e> /__CV which is predicted to be /i:/.

[7] It appears that the only reason the /E/ appears in the first syllable of the SPE underlyers is to account for this dialectal variant they note. They appear to be trying to adhere to a common underlyer principle across all dialects in this instance. Note again footnote 6.

(4) s → [+voice] / V__V

This also can be considered a spelling-to-pronunciation rule as it is surely in existence to govern the relationship between <s> and its phonological realisations /s/ or /z/ depending on the environment. In a phonological account it makes sense to assume either one of these phonemes, or the other, in the underlyer in non-alternating forms. However, SPE does not appear to utilise this approach as can be observed in their exemplification using *music* and *mussel.* As *music* does not alternate it would be more logical to assume an underlying /z/. SPE does have both /s/ and /z/ in their phoneme inventory (SPE: 177). So why make the underlyer an /s/ and apply a rule to give the correct surface form? The reason is, I believe, interference of the orthographic norms on their system. We find that in *music* the SPE underlyer is /musik/, *only* for rule (4) and the rule (1) (u → U / __CV) to apply to it. Why not assume an underlyer /mUziK/? Moreover, how does SPE propose to deal with other words which, based on this kind of underlyer, become problematic?

Consider words such as *fuse.* Would it be underlyingly /fUz/ or /fuse/? If the latter is selected (in a similar manner to *music*) there is again the addition of the final *e*, in this case for no reason except to create the correct environment for rule (4) to work. This situation would be unacceptable as *fuse* would be underlyingly disyllabic purely to allow the *s* to be voiced to [z], a solution which is clearly unacceptable. The argument against this will surely take the position that *fuse* has a surface [z] so why not assume an underlying /z/? If this can be the case, then *music* should also follow this route as the *s* does not surface as anything but [z] for this morpheme. It is noteworthy that in the case of <music> and <fuse> the rules of orthography correctly predict the pronunciations we would expect:

Orthographic rule: <V> is 'long' variant /__<CV>
Orthographic rule: <s> → /z/ /__ <VsV>[8]

Resulting in: <music> → /mjuzɪk/
<fuse> → /fjuz/

4.2.4 The Overgenerality of SPE Rules.

There is also the further problem in SPE in that some of the SPE rules are too general, i.e. they are not at all well constrained. Generality of a rule is not in itself a problem. After all the spelling-to-pronunciation rules by definition must be as general as possible or they would be of no use. The problem is that the SPE underlyers are not nearly as systematic as the orthography[9] which means rule application can occur where it is not wanted.

When we consider some of the examples in which SPE uses graph doubling, and underlyers which could be inputs to the voicing rule, it becomes apparent that the half-way-house method in which SPE utilises these orthographic devices can most charitably be described as inadequate. SPE (48-49) deals again with the issue of doubling to attract stress through analysis of the words *Mississippi, Kentucky, confetti, abscissa, Phillippa* and *Potassium.* These examples do not fit with the standard stressing rules in operation in SPE as removal of the final syllable for stress assignment gives an incorrect antepenultimate stress in each of them. SPE though endeavours to account for the 'non-standard' stress in these items through manipulation of the underlyer using doubling of the codal consonant in the syllable that is required to be heavy, thus attracting stress to the 'correct' syllable. This is unlikely to be what is occurring as these words are all nouns and carry standard

[8] Note: there are obvious exceptions to this rule, e.g. *obtuse*, however this does not remove it as a very general rule of spelling-to-pronunciation. *Obtuse* does not follow default stress so would be considered to be blocking the Spelling Pronunciation anyway.

[9] Even considering the apparent unsystematic look of English spelling, we find that the great majority of words are regular and that aspects such as word class and morphology help to constrain what at first appear to be inconsistencies (cf. the <th> graphemic unit and function vs. lexical words).

penultimate stress (except *potassium).*[10] Regardless of this oversight of the obvious, SPE posits for *Mississippi* a final phonological sequence /...ippi/ to give it penultimate stress. But what of the instances of *s* in the rest of the underlyer? There is no way to stop the application of the 's'-voicing rule which produces a surface form [mizi'zipi] from /misisippi/ after application of the consonant simplification rule C→ Ø / before an identical C.

Interestingly there is an awareness of the need to limit the 's'-voicing rule in SPE through the analysis of *potassium* versus *gymnasium.*[11] This is examined as an afterthought to the problem of accounting for the lack of voicing in the words *consist, consign*, and *consume*, in contrast to the voiced forms in *resemble, design* and *presume*. There is an even more problematic set in *assist, assemble, assign* and *assume*, all of which contradict the voicing rule in the SPE analysis. In the second of the three sets of words the consonant adjacent to the *s* blocks the environment and application of the voicing rule; where in the first set the environment exists and the rule applies. The final set, however, does not have an extra consonant to block the rule at a phonological level. SPE, as a result, posits the idea that the prefix is not *a-* but rather is *as-* giving representations [æs=sist], [æs=sembl], etc. There is no note of *Mississippi* even here. As regards *potassium/gymnasium,* it is at this point that we are first introduced to the idea of alternations and rules that govern which of the variants will surface. It is observed that there is a relationship between the lax vowel /æ/ and the tense vowel /A/ (IPA /e:/). The object of the SPE rules is to predict the correct vowel quality which will apply in the stressed environment. SPE utilises the rule of

[10] The doubling of the <ss> in *Potassium* attracts the stress in an orthographically based system, so although it is not default stress, the double letter in the orthographic underlyer for this word would function similar to the way SPE suggests, thus marking for arbitrary non-standard stress would not be required for this item as it is motivated by the underlyer's construction (cf. *badminton* which is arbitrary).

[11] *Gymnasium* would require arbitrary stress marking; although there is the possibility that the string <-ium> always causes stress in the preceding syllable, e.g. *auditorium, bacterium, delphinium.*

CiV tensing.[12] This rule assumes an underlying lax form which is tensed in the CiV environment (the syllable before this environment) if it is not blocked. As SPE also employs the rule which simplifies double consonants, it employs a double *s* in *potassium* to block the rule. As such, the vowel in *potassium* is neither affected by CiV or by the voicing rule as presumably, although it is not stated, simplification is ordered after voicing. The vowel quality and the <s> in *Gymnasium,* by comparison, are affected as its underlyer does not have any means to block either CiV or voicing as is reflected in its pronunciation.

SPE intricately accounts for all the examples in the last paragraph through utilisation of orthographic devices in a clumsy and non-regular manner. What is noteworthy with all of the examples cited is that they all follow the spelling-to-pronunciation rules, i.e. they are all Spelling Pronunciations and can, without any redundant rules, or the need for corrective rules, be pronounced by a literate without any problem (mainly with default stress, but through utilising arbitrary stress which is orthographically marked, the normal spelling-to-pronunciation rules can still be employed):

[12] The next section will examine the issues of CiV tensing and the SPE Vowel Shift Rule, which is why this brief exposé of CiV does not discuss all of the vowels involved in the CiV equation.

Mississippi - default stress on penultimate syllable, all vowels short due to doubling which also blocks voicing of the <s>.

Kentucky - <ck> dictates a lax vowel in the penultimate syllable and reinforces the stress of the penultimate syllable.

Confetti - standard penultimate stress, coincidental reinforcement with <tt> .

Abscissa - double <s> predicts the lax vowel and reinforces the default stress.

Phillippa - graph doubling predicts the lax vowel quality and reinforces the penultimate stress.

Potassium - double <s> predicts the lax vowel and blocks the voicing of <s> while also marking the stress position.

Gymnasium - arbitrary stress marking. Lack of doubling dictates tense vowel quality and voicing of the <s>.

Consist
Consign
Consume - standard verb stress. The morphemic interface involves two consonants so the vowel in <con_> remains lax.

Design - standard verb final stress.[13] <s> voicing applies. <g> predicts /aɪ/ vowel quality for the <i>.

Presume - standard verb final stress. <s> voicing applies.

Assist - standard verb stress. Double <ss> blocks voicing.

Assign - standard verb stress. Double <ss> blocks voicing. <g> predicts /aɪ/ vowel quality for the <i>.

Assume - standard verb stress. Double <ss> blocks voicing.

Assemble - stress on penultimate syllable as final syllable has no vowel element represented. Double <ss> blocks voicing, and CCC consonant cluster predicts the lax stressed vowel.

For the literate, the above explanations appear intuitively correct. Also the rules proposed in SPE come extremely close to this position, which again suggests that orthographic norms may be the subconscious model within SPE. The simplicity of the spelling system along with the phonological conversion rules is a far more economical mechanism and it is not nearly as fraught with redundant information - or the need to undo effects from other rules.

So what is the overall picture of SPE considering the observations made above? It appears that the shape of the SPE underlyers is an amalgamation produced from trying to fit orthographic rules to a phonological system. In the orthography the

[13] The nominal form doubtless predates the verbal form rather than vice versa, i.e. someone had to design the design.

use of devices such as final *e* or doubling does not have a phonetic correlate, therefore does not require the sort of correction rules SPE is forced to produce. However, acceptance of orthographic underlyers would remove this complex process of manipulation, followed by rule application and the related corrective procedures SPE is forced to employ; as elements of the orthography would be seen for what they are, markers; and as such they would have functions such as stress attraction, and vowel quality marking, but no phonological correlation.

In summary, SPE creates a hugely complex framework to account for surface forms on what appears to be subconscious modelling on the orthographic system; yet never seems to make the connection that the 'abstract underlying representations... correspond directly to English orthography' (SPE: 46), even although they circle the concept throughout. The connection to the orthography is only ever noted as a coincidental matter; the orthography is never considered to be the actual underlying form. The question is: why not?

4.3 Why did SPE not assume orthographic underlyers?

In order to find an answer to this question it is useful to undertake an examination of some of the problems for the SPE system if it were to remain intact as a theory, yet admit the orthography as its underlyers. The problem areas, I believe, probably constitute the strongest motivation for SPE not accepting the orthography as the lexical representation.

Objective examination of the SPE account leads to this question: why was the theory not manipulated to encompass the problems imposed by the orthography, so that the similarity which is so recurrently evident, along with the orthographic devices which are so frequently used, can be brought into the equation as a positive and regularising element? The reason why SPE does not commit itself to this concept is, I believe, threefold. Firstly, there is the adherence to the principle that orthography

has no place in a speaker's active linguistic mechanism; secondly, and more importantly for SPE, admission of the orthography as the underlyer would cause the SPE system untold internal troubles; and thirdly, SPE (whether we like to accept it or not) takes the position that the theory is more important than the empirical facts (see 4.2.2 above). Considering the repeated reiteration of orthographic similarity, it appears that the first of these was not overly concerning for Chomsky and Halle, even although they do not ultimately commit themselves to the obvious conclusion to be drawn from their observations. The second and third reasons though amalgamate to create an unacceptable situation: if orthography is given primary status, there are a plethora of problems, which Chomsky & Halle must have perceived as more distasteful than the consequences of their theory.

Consider as an example the word *game*. If the orthographic form is taken as the underlyer[14] and the SPE system is employed, it must be assumed that the underlyer has a segmental value assigned to the final *e,* giving the underlying form /game/; a disyllabic form, which would require manipulation by rule to a surface monosyllabic form. As spelling norms would need to be consistent across the system, vowel graphs would need to represent lax vowels by default.[15] This must be assumed if the lack of tensing associated with words such as *ham*, *dam*, etc. is to be encompassed. The function of the final *e* then would be required to manipulate the preceding vowel to give the correct quality for the main vowel before it is finally deleted.[16] Apart from the vowel manipulation function this final phonological

[14] The assumption here is that the orthography can be directly translated into the underlying SPE phonological form, which requires a leap of imagination from you, the reader. Obviously there are problem issues for an SPE style account as the likes of <ch> can represent /k/, and <x> can represent /ks/ or /z/. SPE in it's current guise would obviously reflect the phoneme, e.g. *box* in SPE would be /boks/. For the moment though the object of the exercise is to show how basic issues like the number of underlying syllables becomes a problematic issue for the SPE system if a basic orthographic shape becomes the underlyer.

[15] See *Neptune* example above.

[16] It seems very obvious that a similar system is in fact employed in the orthography, where the final <e> of *game* is seen as a symbol which marks the preceding vowel's quality. The beneficial aspect for the orthographic system though is that there is no need to delete anything as the final <e> is a marker, not a phonological segment with no surface reflex (cf. Ehri (1984)).

segment would be redundant for stress purposes as the final *e* is removed anyway in the SPE system (see above regarding *ellipse* and *eclipse*). It could be argued that this in a fundamental way mirrors the situation which occurs when we read. This is true except that there is not the redundant information or the abstractness which the SPE solution would manifest.

It is true that the final <e> in the orthography is a marker of the vowel quality of the <a>, however there is no correlation within the phonology to the final <e>. More relevantly though within the orthographic system, the underlying <a> does not begin life as anything but an orthographic form. In other words there is no need to assume a phonological underlyer that changes as it progresses towards its surface form. Instead the surface form can be seen as a phonological manifestation of the underlying <a>. The final <e> tells us that the vowel quality will be /e(:)/ which the spelling-to-pronunciation norms generate automatically. There is no redundant information in the orthographic form <game>; whereas an underlying phonological form /game/ is not only abstract in that the vowel quality is unrepresentative along with the underlyer being disyllabic where the surface is monosyllabic, but also the SPE system would require a far more complex mechanism than the orthographic system employs to achieve the surface form. For SPE's theory though this is not the only problematic issue pertaining to the possibility of the orthography being the underlying form.

Consider the word *rain.* The <i> would have to be assumed to be the source of the vowel quality as *rain* does not share a similar spelling yet shares a similar vowel quality as *game*, while sharing the vowel graph <a>. The use of the final *e* used in some of the SPE examples (see above) would have to be outlawed in this case if the spelling was assumed to be the underlyer. As a result it would have to be assumed that there is a phonological correlate for the <i> in *rain* and that it has a similar effect to the final *e* in *game* for the purposes of attaining the correct vowel

quality for the surface form. In other words it would have to be assumed that *rain* has an underlying diphthong which is somehow simplified for the surface form, even although it is non-alternating.[17]

Game and *rain* highlight obvious problems for SPE if orthographic forms were to be considered to be the underlying representations. The result for the SPE system would be all kinds of abstract forms which would then require manipulation to give the surface forms - a situation which, although distasteful, is no less complicated or arbitrary than the one SPE develops. The SPE theory itself constrains Chomsky & Halle from accepting orthographic underlyers, with them instead opting to use orthographic devices with the repeated observation that their underlyers frequently share visual similarity with orthographic forms. This position ultimately makes SPE into some kind of hybrid borne a both a phonological and an orthographic system. The overall result of this is an overcomplex system which battles the problems involved in achieving end goals through utilisation of whatever orthographic norms prove useful, and solving what remains with incredibly intricate and complex machinery - which can in no way be assumed to be psychologically real. The greatest of these intricately complex mechanisms though has not yet been discussed, and that is The Vowel Shift Rule.

4.4.0 Vowel Shifting.

One of the most central parts of SPE, if not *the* central part, is the Vowel Shift Rule (henceforth VSR). The motivation for the development of the VSR in SPE is to establish a relationship between the vowel alternations which occur in a number of morphemes. In a system which tries to maintain a single underlyer for all variants of

[17] This situation directly contradicts the situation in SPE where even true diphthongs are seen to be derived from underlying monophthongs. (SPE: 192) states 'contemporary English differs from its sixteenth or seventeenth century ancestor in the fact that it no longer admits phonological diphthongs…in its lexical formatives.' From a theory internal perspective therefore orthography could not be admitted as the underlying form in SPE as it does not adhere to this 'fact'.

a given morpheme - which SPE obviously is - there is a need to try to relate the two alternating phonological vowels to maintain this fundamental concept. On this basis SPE chooses to account for the alternations by means of the VSR, a solution which can only be described as a miracle of linguistic engineering. The following section will examine the VSR as it appears in SPE along with two crucial papers which chart the relevant evolution of the VSR: Halle (1977) and McMahon (1990). This section is not a critical analysis of all things related to and involving VSR (the anti-VSR aspect is dealt with adequately by Jaeger (1985) and does not need to be reiterated here) and does not endeavour to show its shortcomings - except to exemplify why it was reworked by both Halle and McMahon; rather the aim of this section is to examine the VSR as a concept to see whether or not it reflects an orthographic process in a similar manner to other notable aspects of SPE which have been discussed above. The layout of this section therefore will be as follows: firstly the VSR will be examined, followed by a brief discussion of Halle (1977) and McMahon (1990). This will give a picture of the evolution of the VSR and will show it in its most current guise. This will be followed by an examination of C. Chomsky (1970) who tries to maintain an intermediate position between an orthographic solution and an SPE style approach. At this point there will be a thorough examination of the environments involved in the VSR to establish what ties the alternations together and whether or not an orthographic solution is viable in terms of the alternations. The section will conclude with a description of a possible orthographic solution which is undertaken to see whether such a solution is more intuitive and simple in comparison to the other options. The complexity and evolution of the VSR and the environments it affects may seem here to be a bit of an overkill, but the account serves to highlight how SPE style analyses have overcomplicated what is a very simple issue from the orthographic perspective.

4.4.1 Alternations, Tensing, Laxing and Diphthongisation.

To begin it is appropriate to establish which vowels are under discussion. SPE divides the alternations into two groups: alternations of non-back vowels (SPE: 178) and alternations of back vowels (SPE: 186). Considering the non-back vowels first, the alternations involved are:

(1)[18] ā̆y → i as in *divine~divinity, satire~satiric, derive~derivative*, etc.
ī̆y → e as in *serene~serenity, metre~metric, delicious~delicacy*, etc.
ē̆y → æ as in *compare~comparative, explain~explanatory*, etc.

Also to be accounted for with regard to these alternations is the exact opposite direction of phonological change:

(2) i → ā̆y as in *algebra~algebraic, marginal~marginalia*, etc.
e → ī̆y as in *funeral~funereal, manager~managerial*, etc.
æ → ē̆y as in *Canada~Canadian, marginal, marginalia*, etc.

This second set is a mirror image of what occurs with the first set which means the alternations occur in one direction in some contexts and exactly the opposite in other contexts. SPE considers a grammar which contains separate rules to deal with the exact opposite process:

> to be quite intolerable, not only because of the doubling of the complexity, but, more importantly, because it is clear that such a grammar is missing a generalisation. (SPE: 180)

This conclusion makes sense in that what is ideally required is a rule which will account for the alternations while not being constrained by the direction of the alternation between the simplex and complex form. So how does SPE propose to deal with the issue?

SPE takes the position that the surface relationship of the alternants is not as relevant as abstract phonological similarity of this group of alternations as a whole. They suggest that it would be no less economical to substitute (2) with:

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[18] The number sequence of rules and examples in this section begins again at (1) and pertains only to this section.

(3) $\left.\begin{array}{l} i \rightarrow \breve{i}y \\ e \rightarrow \bar{e}y \\ æ \rightarrow \bar{a}y \end{array}\right\}$ in certain contexts

So, rather than try to establish a relationship based on the alternations which actually occur at a morphemic level bound by the orthographic vowel graphs, SPE bases the reverse relationship on tense/lax alternations which exist in the phonemic inventory.[19] The motivation for this is that tenseness is seen as a relevant factor in the alternations regardless of the quality in the simplex morpheme. By employing this lax/tense alternation though SPE is forced into a position where a number of rules are required to get back to the surface form, a process which will ultimately involve the VSR. Before examining the VSR though it is necessary to examine the rules for tensing and laxing required to account for the alternations above as the output from the tensing rule will become one of the eventual inputs to the VSR.

The alternations of the *serene~serenity* group involve laxing of vowels in certain contexts (disregarding the quality for now), while the *vary~variety* group involves tensing in certain contexts. SPE (181) defines the environments for laxing as:

(4) A stressed vowel becomes lax before *-ic, -id*, or *-ish* (though not *-iv* or *-is*), and before an unstressed non-final syllable. In particular bisyllabic affixes such as *-ity*, *-ify* will have the effect of laxing the immediately preceding vowel...and two subcases __CC+VC_0V e.g. *profound~profundity* and __CVC_0V e.g. *divine~divinity*.

Many counter examples are also given in SPE, such as: *scenic, basic, cyclic, hibernate, obese, hibernate,* etc. However, the motivation for the rule appears to be correct as most of the tense vowels of this sort become lax in the complex forms.

[19] It is worth observing that there are no alternations in English which alternate on the tense/lax pairings of vowels at a surface level. All alternations involve vowels which are not as easily related at a phonological level.

This rule is better known as the Trisyllabic Shortening Rule (or TSS) as it affects the third syllable from the end of a word and causes the vowel to be lax.

The rule proposed for tensing vowels in SPE is:

(5)

$$V \rightarrow [+\text{tense}] \; / \; \left\{ \begin{array}{ll} \left[\begin{array}{l} \alpha\text{low} \\ \beta\text{stress} \end{array} \right] \left\{ \begin{array}{l} V \\ \#, \text{ where } \beta = + \text{ if } \alpha = + \end{array} \right\} & \text{(a)} \\ \left[\begin{array}{l} \\ -\text{high} \end{array} \right] C^{1}_{1} \left[\begin{array}{l} -\text{low} \\ -\text{back} \\ -\text{cons} \\ -\text{stress} \end{array} \right] V & \text{(b)} \end{array} \right\}$$

(a) tenses vowels in final and prevocalic position. Thus *vary* and *various*, etc. receive the correct vowel quality. (b) tenses non-high vowels before a single consonant followed by [i] or [e] (or the corresponding glides), which must be followed by another vowel, e.g. *Abel~Abelian*, *manager~managerial*, *Canada~Canadian*. Note [i] does not become [ɪ] as (b) is confined to non-high vowels, thus *vicious, reptilian*, etc. The tensing rule ultimately (Halle (1977)) evolves into the CiV tensing rule as the vowel preceding this environment - within the constraints outlined - becomes tense. Obviously both of the above rules achieve opposite effects: (4) laxes while (5) tenses. Also the environments for the rules sometimes overlap, so the rules are ordered with (4) appearing before (5) so forms such as *simultaneous* and *emaciate* have a tense and not a lax vowel.

Returning to the original alternations these rules mean we are now a step closer in that we now have rules to convert from tense to lax in certain contexts and lax to tense in other contexts. This is obviously only half way to the solution though because the vowel qualities in the newly tensed vowels are qualitatively different to the surface forms, as well as being in some cases monophthongal where a diphthong is ultimately required. The latter of these two aspects is addressed first in SPE.

They observe 'that English tense vowels have off-glides' (SPE: 183): [y] for non-back vowels and [w] for back vowels. For the sake of simplicity SPE assumes every tense vowel will produce an off-glide thus tense vowels are subject to the diphthongisation rule:

(6)

$$\emptyset \rightarrow \begin{bmatrix} -\text{voc} \\ -\text{cons} \\ +\text{high} \\ \alpha\text{back} \\ \alpha\text{round} \end{bmatrix} \Big/ \begin{bmatrix} +\text{tense} \\ \alpha\text{back} \end{bmatrix} \_\_\_$$

(6) inserts the relevant off-glide for every high tense vowel as is determined by the vowels backness and roundness. Through application of this diphthongisation rule to the relevant items allows SPE to achieve the lax to tense alternation set out in (3) above. There is still the obvious problem that this does not yet give a correct surface form, i.e. the surface forms in the morpheme still require further manipulation. Chomsky & Halle note that what is required is a rule which will achieve the following (focusing on front vowels only for the moment):

(7)

ɪ̄	ē	ǣ
↓	↓	↓
ǣ	ɪ̄	ē

This rule is part of what will be SPEs VSR. They state that this 'is, in fact, a synchronic residue of the Great Vowel Shift of Early Modern English' (SPE: 184) - a very interesting claim which strongly suggests a speaker has underlyers akin to those from Middle English phonological forms. Returning to the original examples though there is now a (rather indirect) path through the outlined rules from the change SPE originally made to the actual surface pronunciations. Taking *divine, serene* and *profane* the following rules apply:[20]

[20] There are surface phonetic details which cause further definition in the surface form, however they are not relevant to this discussion.

(8)	UNDERLYER	divīn	serēn	profǣn
	DIPHTHONGISATION RULE (6)	divīyn	serēyn	profǣyn
	VSR RULE (7)	divǣyn	serīyn	prefēyn

Of great interest is that in the footnote regarding this derivation SPE notes orthography utilises a final <e> to prompt the tense alternant in the simplex form. To attain their lax vowels the laxing rule (4) is utilised in complex forms to produce the correct lax vowel:

(9)	UNDERLYER	divīn+i+ty	serēn+i+ty	profǣn+i+ty
	LAXING RULE (4)	divin+i+ty	seren+i+ty	profæn+i+ty

This accounts for the alternations noted in (1) above, but what about (2) above, where the lax vowel appears in the simplex form?

The simplex forms are derived directly from the lexical derivations with only those vowels which require tensing in final position undergoing any rule application:

(10)	#TENSING RULE 5(a)	#ælgebræ	#vǣri	mænæger

Derivation of the complex forms involves application of the following rules:

(11)	UNDERLYER	ælgebræ+ic	vǣri+i+ty	mænæger+i+æl
	TENSING RULE (5)	ælgebrǣ+ic	vǣrī+i+ty	mænægēr+ī+æl
	DIPHTHONGISATION (6)	ælgebrǣyic	vǣrīyity	mænægēyrīyæl
	VSR (7)	ælgebrēyic	vǣrǣyity	mænægīyrīyæl

So what has been gained by these acrobatic rules to achieve the opposing alternations? It would appear that all that is achieved is avoidance of the distastefulness of stating two opposite rules. Although at what cost? The overwhelming complexity of the derivation is surely just as disagreeable in a grammar as one that contains two simple rules one the exact opposite of the other.

SPE states that by employing the rules outlined they have in fact drawn out what is different about the alternations (namely one tenses while the other laxes) while at the same time showing what is the generalisation underlying both (that they

both involve vowel shift). Although the solution is far from intuitive and seems to miss the even more obvious generalisation that the inverse alternations are in reality the same alternations just from different directions - which must surely also be seen as a relationship. If this is assumed then only the direction of the alternation becomes of relevance, a reality which the orthographic system automatically addresses (see below).

The back vowels are affected by the same rules as the non-back vowels. The alternations involved with the back vowels are:

(12) ə ~ ōw as in *Newton~Newtonian, custody~custodian*
ā ~ ōw as in *verbosity~verbose, conic~cone*
ʌ ~ æw as *in profundity~profound, abundant~abound*

What is missed in the statement of the back vowel alternations in SPE is that the first two are part of the three way alternation [ə]~[ɔ]~[o]. Instead of observing this SPE states that the first two sets of alternations can both apply to one morpheme, e.g. *harm*[ə]*ny, harm*[o]*nious*, and *harm*[ɔ]*nic*.[21] The derivation of these forms in SPE is:

(13)	UNDERLYER	harmɔn+y	harmɔn+i+ous	harmɔn+ic
	STRESS ASSIGNMENT	hármɔn+y	harmɔ́n+i+ous	harmɔ́n+ic
	TENSING RULE (5b)		harmɔ̄n+i+ous	
	DIPHTHONISATION (6)		harmɔ̄wn+i+ous	
	VOWEL SHIFT		harmōwn+i+ous	

But SPE does not acknowledge this three way split because of the lack of the third alternant in examples such as v*erbose~verbosity* which only uses part of the three way alternation. Consequently, there is the need to employ different underlying vowels for forms which should more appropriately share a common underlying element (*harmony* is assumed to have an underlying lax vowel where *verbose* is underlyingly tense). As a result, the derivation for *verbose* requires use of the laxing rule in the derivation:

[21] Ignoring the next step in SPE which is to acknowledge that in GA [ɔ] is replaced by [ā].

(14)	UNDERLYER	verb+ɔ̄s	verb+ɔ̄s+i+ty
	STRESS RULE	verb+ɔ́s	verb+ɔ́s+i+ty
	LAXING RULE (4)		verbɔ́sity
	DIPHTHONGISATION (6)		verb+ɔ́ws
	VOWEL SHIFT	verb+ṓws	

This approach in SPE does however give uniformity of process to both the front and back vowels, with the vowel shift for back vowels involving the following shifts:

(15)

ū	ō	ɔ̄
↓	↓	↓
ɔ̄	ū	ō

What it does not capture is the generality which affects all of the above alternations, namely that they are confined at a morphemic level, with the orthography guiding how the alternations will ultimately be manifest in a given environment.

4.4.2 The Vowel Shift Rule Proper.

SPE considers the Vowel Shift to be 'without doubt the pivotal process of Modern English Phonology' (SPE: 187). The full set of shifting vowels is as follows:

(16)

ī	ē	ǣ	ū	ō	ɔ̄
↓	↓	↓	↓	↓	↓
ǣ	ī	ē	ɔ̄	ū	ō

All of the input vowels to the rule are tense, as are the outputs. The basic rule is (SPE: 187):

(17)

$$\begin{bmatrix} +\text{tense} \\ \text{V} \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} [-\alpha\text{high}] \,/ \begin{bmatrix} \underline{\quad} \\ \alpha\text{high} \\ -\text{low} \end{bmatrix} & \text{(a)} \\ [-\beta\text{low}] \,/ \begin{bmatrix} \underline{\quad} \\ \beta\text{low} \\ -\text{high} \end{bmatrix} & \text{(b)} \end{array} \right\}$$

The rule is ordered so the outputs of rule (a) are inputs to (b), so the overall effect is as follows (including dipthongisation as it occurs prior to the VSR in SPE):

(18)

	ī	ū	ē	ō	ǣ	ɔ̄
	↓	↓	↓	↓	↓	↓
DIPHTHONGISATION	īy	ūw	ēy	ōw	ǣy	ɔ̄w
	↓	↓	↓	↓	↓	↓
VSR (a)	ēy	ōw	īy	ūw	**(not applicable)**	
	↓	↓			↓	↓
VSR (b)	ǣy	ɔ̄w	**(not applicable)**		ēy	ōw

The rule as it stands though is inadequate as it applies to all tense vowels arbitrarily and doesn't apply to other environments SPE considers it should apply to. Further refinement and contextual filters are used in SPE to address these issues. These are discussed here, although as will become evident in the Halle (1977) paper, they will ultimately be removed from the VSR, a removal that reveals the VSR for what it is: a reworking of basic orthographic rules. For the moment though (and to accurately reflect the SPE VSR), the following environment refinements were introduced:

(19)

$$\begin{bmatrix} \underline{\quad} \\ \gamma\text{back} \\ \gamma\text{round} \end{bmatrix}$$

Utilisation of this filter, which requires agreement between backness and roundness in the input vowel, limits the tense vowels affected by the VSR to [ī, ū, ē, ō, ǣ] and

[ɔ̄]. This is required to stop the [ā] in *Chicago* and *father* from shifting.[22] Further limitation involves:

(20)

$$\begin{bmatrix} \_\_\_\_ \\ +\text{tense} \\ +\text{stress} \end{bmatrix}$$

which limits the effect of the VSR to those environments which are both tense and stressed, which correctly predicts that only the vowels marked as bold undergo vowel shift in examples such as *v**a**rious* and *var**i**ety*.

Of course limitation of the environment to [+tense] is too limiting and a further context is introduced:

(21)

$$\begin{bmatrix} \_\_\_\_ \\ -\text{tense} \\ +\text{high} \\ +\text{back} \end{bmatrix}$$

This context is introduced basically to deal with the lax phonological segment /u/ which through VSR will by default become [ʌ]. By including this SPE can account for the alternation involved in examples such as *assume-assumption*. In the former the underlying /u/ is tensed, acquires the pre-vocalic glide and the diphthongal element to become /yuw/ in the simplex form, whereas the /u/ in the complex form will vowel shift to [o] (under the new context) which will then undergo rounding adjustment to [ʌ]. SPE externally motivates this latter situation as they say this is involved in the *profound~prof**u**ndity* alternation.[23]

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[22] SPE assumes /a/ is a tense vowel which is why a limitation filter is required. See Halle (1977) below.

[23] The motivation for *profound~profundity* is odd in that it strays from SPE's original concept which assumes a single underlyer for all surface forms of a morpheme, instead positing different underlying forms for the simplex and complex forms of the morpheme {profound}: /prVfūnd/ versus /prVfund/(ity). In making the underlyers different SPE allows the /prVfūnd/ underlyer to undergo both stages of vowel shift, diphthongisation and rounding adjustment to give surface [āw]. In the case of /prVfund/ the new VSR context allows the /u/ to shift to [o] which then becomes input to rounding adjustment giving a final surface form [ʌ] which is needed for *profundity*. This could be seen as directly following the spelling in that the difference in representation of this morpheme is evident in the spellings of the simplex and complex form – NOTE: {profound/profound} is one of the few morphemes which breaks the Morpheme Spelling Principle

The final addition to the VSR rule in SPE is the addition of the special context marker [+F]. This allows admission of a variety of alternations, each of which must be marked with the [+F] feature. It allows the lax vowel [i] to undergo the vowel shift to produce the [i]~[æ] alternation in irregular verbs such as *sit~sat*. Also covered by the [+F] is the [ay]~[æ] alternation found in *satisfy~satisfaction* - although the underlyer for this is alarmingly abstract. The *clear~clarity* alternation from underlying [klær] is also justified through the [+F] feature. Altogether SPE notes a number of these 'small subregularities' and ascribes them a place in the VSR. Based on these contextual refinements the final SPE VSR is as follows:

(21)

$$\begin{bmatrix} \gamma\text{back} \\ \gamma\text{round} \\ \text{V} \end{bmatrix} \rightarrow \left\{ \begin{array}{l} [-\alpha\text{high}] \,/\, \begin{bmatrix} \underline{\quad} \\ \alpha\text{high} \\ \text{-low} \end{bmatrix} \\ [-\beta\text{low}] \,/\, \begin{bmatrix} \underline{\quad} \\ \beta\text{low} \\ \text{-high} \end{bmatrix} \end{array} \right\} \,/\, \left\{ \begin{array}{l} \begin{bmatrix} \underline{\quad} \\ \text{+tense} \\ \text{+stress} \end{bmatrix} \\ \begin{bmatrix} \underline{\quad} \\ \text{+F} \end{bmatrix} \\ \begin{bmatrix} \underline{\quad} \\ \text{-tense} \\ \text{+high} \\ \text{+back} \end{bmatrix} \end{array} \right\}$$

4.4.3 Halle (1977).

The SPE VSR was obviously going to court controversy when it was published, but the reason Halle (1977) continues to refine the VSR is because since the original publication of SPE 'a number of challenges to [VSR] have appeared, [although] these challenges have failed to deal with the critical core of [SPE's] proposal' (1977: 613). In other words the fundamental concept of the VSR is extremely hard to refute as it does account for the alternations – probably because its roots lie in orthographically bound phonological alternations that all literate speakers are aware

of. On the basis that VSR was not destroyed as a concept in the 9 years since SPE's publication, Halle (1977) endeavours to refine the rule and perhaps more importantly, deal with the more unpalatable contexts which were 'bolted' to the side of VSR and which accounted for alternations which were not included in the original motivation for the rule.

Halle states that the alternations /ay - i, iy - e, ey - æ, aw - ʌ, ow - a/ and /uw - ʌ/ 'can be captured only with the help of a very complicated rule that has the effect of turning each of the long tense diphthongs into specific lax monophthongs' (1977: 614), so the fundamentals of the VSR are to remain intact in Halle (1977). Of interest is that he does observe the *margin*[ə]*l* - *margin*[æ]*lity* - *margin*[ey]*lia* as a three way alternation, a position SPE had difficulty acknowledging, not least because of its lack of schwa. The question is what does Halle modify in the VSR to improve on its SPE form?

The three contexts which were applied conjunctively to the basic SPE VSR rule are:

A. stressed tense vowels
B. vowels marked as [+F]
C. the high back vowel [u]

Halle first addresses the alternations marked with the feature [+F] in SPE. The [+F] feature was introduced to handle the following vowel alternations:

(22) a. *lie-lay, eat-ate, begin-began, sit-sat, sing-sang, choose-chose*, etc.
b. find-found, bind-bound, break-broke, dig-dug, wear-wore, etc.
c. write-wrote, rise-rose, speak-spoke, get-got, tread-trod, etc.

In place of the [+F] feature Halle (1977: 316) proposes that these alternations are not part of VSR, but rather can be accounted for with the rule:

(23) a. V → [+low, -high]
b. V → [+back]

This new set of rules is motivated by analysing the vowels involved in (22) at an underlying level, i.e. the SPE style abstract vowels for the alternations which will be input to the VSR. Through approaching these alternations in this way Halle finds common features in the underlyers. Those in (22) a. involve a past tense of the stem vowel which is [+low, -high] (rule (23) a. applies). For those in (22) b. the stem vowel becomes [+back] in the past tense (rule (23) b. applies). Finally the alternations in (22) c. involve application of both rules (23) a. and b. to attain the correct past tense vowel. Halle states:

> We thus have three quite distinct processes in English that can be expressed quite simply if it is assumed that the processes affect vowels that subsequently will undergo Vowel Shift. If Vowel Shift is not assumed to be a synchronic rule of the language, the characterisation of these processes becomes hopelessly complex. Halle (1977: 316)

This seems to overlook the fact that all of these alternations are irregular past tense forms which must be learned. More important than this though is that all of the alternations are directly reflected in the spelling. Speakers must learn all of these irregular forms, otherwise they will produce incorrect regular past tense forms. The spelling of the words in all of these cases overtly represents the change in vowel quality in the past tense as these are some of the few examples where the morpheme has different spelled forms, in defiance of the Morpheme Spelling Principle. The absolute requirement to learn these alternations is reflected in the overgeneralisation mistakes made by those who have not yet learned the irregular nature of the alternations, e.g. *break -*breaked*, *wear -*weared*, etc. Whether the spelling is learned first or not, these alternations must all be learned individually, along with their spellings. To try to create a phonological motivation is ultimately fruitless as all of the words affected by the phonological rule will by definition require to be marked as such which is no more economical than to say they are irregular and must be

learned. If they are not marked then all phonological environments which meet the criteria will be affected by the rule, e.g. *sneeze-*snoze* (following *speak~spoke*.)

Regardless of this necessity for listing just outlined, the allomorphy readjustment rule proposed by Halle has the beneficial aspect that it removes the [+F] feature from the VSR. The vowels in (22) are still required to undergo VSR to become the correct surface forms, but it is less 'bolted on' to the VSR in this new format as it is not a direct environment affected by the rule, but is now instead a set of vowels which happen to also feed into the VSR.

Halle next addresses the issue of the VSR only affecting those vowels which are [+tense, +stress]. Instead of this he posits that all [+tense] vowels are input to VSR. In doing this there is also removal of the necessity of agreement in backness and roundness used as a filter in SPE. This introduces a problem which was side-stepped in SPE and that is how to deal with words such as *Chicago, rajah* and *garage*. SPE limited these vowels from vowel shift as they did not agree in terms of backness and rounding and as such did not undergo vowel shift. But by making all tense vowels shift, Halle requires a different solution. Halle's solution is to introduce rule (24):

(24)

$$[\alpha\text{long}] \rightarrow [\alpha\text{tense}] \quad / \quad \left[\underline{\quad} \begin{Bmatrix} \text{-low} \\ \text{-long} \end{Bmatrix} \right]$$

This rule restricts the correlation between vowel length and tenseness to the environment outlined [-low, -long]. SPE on the other hand *always* links tenseness and length. In proposing this limitation the /a/ vowel is no longer interpreted as tense, so is not subject to the VSR which ensures the vowels in *Chicago*, *rajah* and *garage* do not shift. Various dialectal variants are examined in Halle (1977) with regard to this new limitation. The specifics of the dialectal rules though shall not be examined here as they are not general, but rather concern General American English. Through

this rule addition though another of the filters of the SPE VSR is removed, ultimately moving the revised VSR to a position where it is more in step with spelling norms.

The final context of the SPE VSR involves the lax, high, back vowel [u] which becomes [ʌ] in the SPE account through application of VSR and an unrounding adjustment. Halle (1977) chooses to remove this context from VSR and instead deal with the issue of producing surface [ʌ] in a different manner. The new solution involves assuming an underlying [ʌ] in examples such as *reduce-reduction* which in the simplex form undergoes tensing and vowel shift to give [ɨ]. In order to complete the account of the *reduce-reduction* alternation (25) is introduced.

(25) [+syl, +back, +high] → [+round]

This rounds the [ɨ] to [ū] which then attracts the prevocalic glide[24] and the diphthongising off-glide to give [yūw] in the simplex *reduce* form. This reworking of course creates problems of its own: *vary* and *trochaic* have now to be 'idiosynchratically marked as exceptions to Vowel Shift'. Also the *profound-profundity* alternation is problematic. This is overcome through assuming in the long variant a vowel which is [+high, +back, -round, +tense, +long] (/U/). As all tense vowels now undergo vowel shift and diphthongisation still applies this will produce the surface [āw]. To account for the lax alternant [ʌ] rule (26) is required:

(26) [+back, -round, -long] → [-high]

[24] I have not dealt with any of the machinery to account for the prevocalic glide in either SPE or Halle. I have ignored this because in an orthographic system these things appear to be environment sensitive. In the relevant dialects which have this glide insertion in all its possible contexts (General American having restricted appearance of the glide), it occurs in every environment it can: e.g. in orthographic environments such as <-ew> except if the consonant before the <-ew> is <l> or <r> (e.g. *few, stew, dew* etc. but not *blew, drew, crew, slew*), <u+suffix> (*ambiguous, individuate*, etc.) and <-uCV> (*angular, impudent, cube, cucumber*, etc.). These appear to be the only triggering environments. All pronunciations appear to adhere to these orthographic triggers and it appears that it is also independent of stress when viewed from the orthographic perspective. Consider *angular* ['aŋgjələ(r)] as compared to *cucumber* ['kju:kʌmbə(r)]; it appears to be the <uCV> environment which is relevant.

Halle (1977) ultimately changes the VSR so that it applies to all tense vowels. The problematic contexts are removed which is a positive step for the VSR. Halle (1977) also moves away from excessive abstractness in some cases also, even noting that 'the underlying representations are more directly related to the surface reflexes' (1977: 623), although it is still far from a concrete account. The VSR as it is defined by Halle (1977) is as follows:

(27)

$$\begin{bmatrix} V \\ +tense \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} [-\alpha high] / & \begin{bmatrix} \underline{\quad} \\ \alpha high \\ -low \end{bmatrix} \\ [-\beta low] / & \begin{bmatrix} \underline{\quad} \\ \beta low \\ -high \end{bmatrix} \end{array} \right\}$$

Note: It is worthy to observe that what Halle has achieved is removal of those aspects of the VSR which are most problematic and do not adhere to the orthographic level. All affected examples now are bound by the relevant orthographic graph as it appears in a specific morpheme for the alternations, for example *divine~divinity*, while aspects marked in terms of the Morpheme Spelling Principle, such as *speak/spoke* and *profound~profundity*, have now been removed. Is this purely coincidence or is it the case that Halle's changes to the VSR inadvertently reveal the root of the VSR in the orthography (as suggested in Jaeger)? The return in Halle (1977) to a VSR which is more streamlined in terms of orthography suggests this to be the case.

4.4.4 McMahon (1990).

The final reworking of the VSR is covered in McMahon (1990), which endeavours to constrain VSR by reworking it within the framework of Lexical Phonology. There are two main motivations for this reworking: the problems with abstract underlyers and free rides.[25] As McMahon notes, earlier accounts of the VSR are unacceptable because of these aspects and must be constrained. Also addressed is the implausibility of the assumption that 'children learning Modern English internalise what is basically a Middle English Vowel system (with the addition of various underlying vowels which equally do not surface in English)' (1990: 200). In an endeavour to address these problematic aspects of VSR therefore, McMahon employs SPE's more constrained descendant: Lexical Phonology (LP), which can account for many of the problem issues which remain totally unconstrained in SPE. McMahon assumes a two stratum model of lexical phonology.

In order to constrain the application of the VSR to alternating morphemes McMahon proposes to apply the LP Strict Cycle Condition (SCC). The SCC stipulates that cyclic rules only apply in derived environments - environments which have been created through addition of a morpheme, or where the original form of a given morpheme has been changed from its original form (within the same cycle, as the SCC is cyclic). There are problems though in that in earlier accounts of LP the standard placing of the VSR is as a stratum 2 rule which is not bound by the SCC (Halle & Mohanan (1985)). The motivation for this placement on stratum 2 is that many of the simplex forms would not be inputs to VSR as they are not derived environments and as such would not shift, e.g. *divine, sane*, etc., thus the rule cannot

[25] Non-alternating forms such as *bee, house, pine, road*, etc. must undergo 'free rides', in SPE and other accounts of VSR, as they all contain a tense vowel which by default will be put through the VSR. To counter this automatic application of the rule which would produce an incorrect vowel quality, an abstract pre-shift vowel is used in the underlyer in order to allow the system to automatically produce the correct surface form. The term 'Free Ride' is used as there is no alternation motivation requiring the rule applies (the form doesn't really need to shift), but it gets of free run through the VSR anyway to keep the surface forms true after the underlyer is modified to the abstract form.

be cited on stratum 1 as it will only affect derived environments. McMahon, however, observes that if the VSR were only to apply to the derived members of the relevant alternating pairs this would allow VSR to be situated in stratum 1 where, as a cyclic rule, it would be subject to SCC. In situating the rule on stratum 1 the free ride problem is removed through limitation of the application of VSR only to the derived alternants which also has the added bonus of removing the need to posit abstract underlyers for non-alternating forms.

There is a necessity to alter the structure of the VSR when it is moved to stratum 1 though. The reason for this is that although it can easily account for alternations of the *various-variety*, *comedy-comedian* type, it cannot account for the *divine-divinity*, *serene-serenity* type alternations. In the first type of alternations the vowel in the simplex form is underived so does not shift, whereas in the complex form the affixation and application of tensing rules allows the VSR to shift the vowels. In the latter type the derived environment has a lax or short vowel, so is not affected by the SPE VSR which only affects [+tense] vowels. To deal with this issue McMahon proposes to replace the SPE VSR with two vowel shift rules: a tense VSR and a lax VSR. Through splitting the rule into two separate rules, both types of alternation can be accounted for. The tense VSR is the SPE VSR (before the addition of the special contexts), which is now cited on stratum 1, with the inputs resulting from tensing rules. The lax vowel shift is as follows:

(28)

$$\begin{bmatrix} V \\ -\text{tense} \\ +\text{stress} \end{bmatrix} \rightarrow \left\{ \begin{array}{ll} [-\alpha\text{low}] \,/ & \begin{bmatrix} \underline{\quad} \\ \alpha\text{low} \\ -\text{high} \end{bmatrix} \quad \text{(a)} \\ [-\beta\text{high}] \,/ & \begin{bmatrix} \underline{\quad} \\ \beta\text{high} \\ -\text{low} \end{bmatrix} \quad \text{(b)} \end{array} \right\}$$

The lax VSR affects its input vowels in exactly the opposite way to the way the tense VSR affects its vowels. Instead of lowering tense vowels, the lax VSR raises lax vowels. All underived forms are assumed to contain a vowel quality which agrees with the surface pronunciation of the simplex form, so diphthongs such as /aɪ/ in *divine* become part of the underlying system, which as the discussion of SPE above shows, was not the norm. The problem is that this does not now feed into the lax VSR. The solution to this, according to McMahon (1990: 215), is that Trisyllabic Laxing will apply to diphthongs of the type appearing in items such as *divine*, with the process first removing the [-ɪ] element from the diphthong, after which the vowel undergoes the lax VSR to give the correct surface form [ɪ] in the derived item *divinity*. Through using laxing rules, which produce inputs to the lax VSR, McMahon accounts for both types of alternation from diphtong to monophthong (*divine~divinity*) as well as from monophthong to diphthong (*vary~variety*), while also gaining the position where simplex morphological forms are phonologically surface true.

There are other 'alternations' discussed in McMahon (1990) mainly regarding strong verb past tense forms, however these will not be discussed here as they are a different kind of alternation to those affected by Vowel Shift - if indeed they are alternations in the true sense. Also discussed is the insertion of the prevocalic /j/ glide (see footnote 24 above).

In summary McMahon (1990) restricts the VSR to only those environments which change, which is beneficial. In placing the rule on stratum 1 in LP both the free rides and the extreme abstractness of SPE are eliminated. Also, the two kinds of alternations are accounted for in a more logical manner than in SPE because a different rule is applied as is determined by the direction of the alternation, e.g. whether the alternation is from [ɪ] to [aɪ] or from [aɪ] to [ɪ]. McMahon (1990) is, of all the above accounts of VSR, the most logical and intuitive. Only one criticism can

be levelled at this account of VSR: surely the alternations, regardless of direction, are ultimately the same process? In other words, is there not some way of stating a rule which is not abstract like SPE's and Halle's VSRs, but which encompasses this solution in a similarly constrained but more direct manner?

4.4.5 C. Chomsky (1970).

There is a study which offers a possible alternative solution, although the implications of the basic concept proposed in the study are neither fully realised nor taken to their logical conclusion - mainly due to the objectives of the author falling in the area of literacy teaching more than ascertaining how linguistically relevant orthography may be. The paper in question is C. Chomsky (1970) and although it is not a study that specifically examines the VSR (as the SPE VSR is accepted as a solution in this paper) it is relevant to a possible alternative to the VSR. The fundamental issue in the paper is based around the fact that English orthography is based on the Morpheme Spelling System (one spelling for each morpheme) and that this allows us to read words aloud[26] with great accuracy, through application of standard rules, reflects that the orthography holds some kind of key to the pronunciations associated with a given morpheme. C. Chomsky (1970) examines these issues within the framework of Generative Phonology, but with a position on the role of orthography which leaves her somewhere between SPE and the position of possible orthographic primacy which this thesis endeavours to establish.

As C. Chomsky is interested in the benefits of orthography, she begins by correcting the commonly stated misconception about English spelling: that it is not a deficient spelling system, but rather that it is merely a relatively poor system for representing surface spoken language, e.g. *atom* and *atomic* share the same <atom->

[26] A Spelling Pronunciation can always be produced from a written form. Words which are not Spelling Pronunciations must be learned as such, e.g. *Sean, Siobhan, Mhairi.*

spelling yet the pronunciation is not reflected in a 1:1 phoneme to grapheme correspondence in the written forms.[27] A frequently reiterated point in C. Chomsky is that the spellings of words have a lot in common with the lexical representations proposed in SPE which are described as follows:

> English has many kinds of surface phonetic variations which need not, and preferably ought not, be represented in the lexical spelling (underlying representation) of words. They are wholly predictable within the phonological system of the language, and are therefore best introduced within the grammar by means of automatic phonological rules. C. Chomsky (1970: 292)

This statement could equally be applied to conventional spelling. The spelling is not a representation of the phonetic reality of the language but instead offers 'the advantage of expressing an underlying reality of the language which is masked by surface phonetic features' (C. Chomsky (1970: 289)). In other words the great versatility afforded by the Morpheme Spelling Principle (MSP) is considered by C. Chomsky as a near-perfect reflection of the lexical representations of words. She recognises that without the MSP the relationship between variant surface forms of morphemes would be lost, e.g. {nation} in *nation, national, nationality* and *nationalistic*. She states that because rules can be developed to derive all forms from a common underlyer, 'the principle adhered to is that phonetic variation is not indicated in the spelling when it is predictable by general rule' (1970: 291). Not only is this the proposed way that SPE's lexical representations work, but *this is exactly what the orthography already achieves*, a point C. Chomsky is eager to highlight.

Her motivations for discussing this issue are mainly concerned with the benefits this similarity might hold for teaching children to read, as the following statement on the orthographic system reflects:

> ...the conventional orthography, by corresponding to lexical spelling rather than phonetic representation, permits immediate direct identification of the

[27] Note: the literate speaker can ascertain from the written form which of the pronunciations will be used as determined by the morphological context.

> lexical item in question, without requiring the reader to abstract away from the irrelevant phonetic detail. C. Chomsky (1970: 291)

This seems to be a valid point as fully literate speakers read at a speed which must be tapping a deeper level of the orthography rather than getting caught in the phonetic detail (Kolers (1970)). Of course another possible interpretation is that the similarity reflects the possibility that the orthography and the lexical representation are one and the same thing, a situation which also adequately accounts for the speed of reading. C. Chomsky differs in opinion from the view suggested in this thesis in that she does not go as far as to state this as a possibility. However, she considers the spelling and the lexical representation to have common information and construction; although there seems little reason not to assume that the orthography *becomes* the lexical representation for the literate as this explains both the similarity of Generative Grammar rules to spelling-to-pronunciation rules, and the productivity observed by the papers outlined in precious sections (cf. Giegerich (1992a)). An examination of C. Chomsky (1970) reveals that the only reason she does not consider this to be a possibility is because of the problematic area concerning those items which are not Spelling Pronunciations, e.g. *sword, freight* and *guard.* But this must be an unacceptable reason for rejecting the possibility of orthographic underlyers because a theory which can deal with <-gh-> and silent <w> will certainly be no less complex than a grammar which has the Vowel Shift Rule - and in all likelihood will probably be simpler. Ultimately, C. Chomsky (1970) reinforces SPE's view on the similarity of lexical representations and conventional orthography, although the overlap between the orthography/lexical representations is much greater in this paper than it is in SPE.

One of the most interesting observations in C. Chomsky (1970) is her reference to 'consonant alternations' (those consonants which undergo velar softening in the affixed form). C. Chomsky considers them similar to vowel alternations. The following examples of consonant alternation are cited (1970: 292):

(29)

[k] - [s]	medi**c**ate - medi**c**ine
[g] - [dʒ]	prodi**g**al - prodi**g**ious
[d] - [dʒ]	gra**d**e - gra**d**ual
[t] - [ʃ]	resident - resident**i**al
[t] - [tʃ]	fac**t** - fac**t**ual
[z] - [ʒ]	revi**s**e - revi**s**ion
[s] - [z]	gymna**s**tics - gymna**s**ium

In these examples we see variant surface phonological forms of the bold graphs as dictated by the graph's environment. Of course this is not how C. Chomsky would describe this. Her description is more along the lines that the underlying segment which corresponds to the bold graph would be seen to be affected by certain predictable processes, as is determined by the morphology, to give the variant pronunciations (which is, coincidentally, in keeping with the orthography). The most interesting aspect of these consonant alternations is that they can only be accounted for synchronically through assuming either orthographic reference or more controversially through assuming an orthographic underlyer. Consider the following words all of which involve the velar softening alternations /k/ → /s/ or /g/ → /dʒ/. Examples are taken from SPE and McMahon (1990):

(30)

AFFECTED BY VELAR SOFTENING	**NOT AFFECTED BY VELAR SOFTENING**
SPE* examples:	
reciprocity	*reciprocal*
receive	*kill*
	lackey
McMahon** (1990) examples:	
Stoicism	*Stoic*
lyricist	*lyric*
analogise	*analog*
	monarch
	monarchism
	anarchy
	anarchist

* SPE (168) marks those in the right hand column as [-rule (6)] thus the rule is not applied, where rule (6) is k → s /__ {i or e} and g → dʒ /__ {i or e}. This marking is both arbitrary

and is no more economical than listing each item.

** McMahon (1990: 205) takes the position that Velar softening 'is completely lexicalised and non-automatic'. In other words each morpheme which will be affected must be learned. This solution also misses the common denominator in the affected items.

These examples are interesting as the alternations can easily be accounted for if the orthography is assumed to be of relevance, i.e. if the consonant *graph* is assumed to be the affected item rather than a phonological segment. On examination it is obvious that only items with <c> or <g>[28] are affected by Velar Softening. The SPE rules predict *monarch~monarchism* would be affected, which it is not as it involves <ch> and not <c>. Although <ch> is pronounced /k/, words which have a <ch> are not affected by the rule - likewise <ck> and <k>. If Halle (1977: 615) is also considered we indirectly observe the accuracy of this assertion. He cites the following examples to show how the 'root initial /s/ is voiced' in certain environments and why it is not in others. The examples are:

(31)	a.	*consign-resign*	b.	*incite-recite*
		consist-resist		*incipient-recipient*
		consult-result		*concede-recede*
		consent-resent		*concession-procession*

Halle states that those in (31)a. which have a voiced /s/, have so due to the final vowel in the prefix which gives a V__V environment and thus voices the /s/ to /z/. The right hand examples in (31)b. do not follow this pattern which Halle ascribes to an underlying /k/ which is only an /s/ through velar softening. Thus if the voicing rule is ordered before the velar softening rule the irregularity of group b is accounted for. But why does Halle assume an underlying /k/ in these words? There is no alternation of the sort outlined by C. Chomsky in these examples, so they cannot be assumed to be 'alternating'. So why the /k/? Halle has drawn on the orthography for this solution as only through the presence of <c> can the /k/ be validated. If we do not assume that the solution pertains to orthographic underlyers then there is nothing to dictate which

[28] The <c> examples are more clear in these examples.

examples should have underlying /s/ and which have underlying /k/. The rule Halle has accounted for is: <s> can be voiced in a V__V environment but <c> manifested as /s/ in the same environment cannot - which again suggests a rule in generative phonology is ultimately based on a spelling-to-pronunciation rule. C.Chomksy must have been observing this kind of orthographic regularity as SPE is not able to account for why some words do not undergo velar softening yet C. Chomsky is ascribing it to the specific graphs in the spellings; and although the orthography is not seen as the underlyer, the observation suggests she is (at some level) aware that the orthography is the key to velar softening as the graphs are being used to tie the alternants in her examples.

C. Chomsky seems to have been very aware of the importance of the spelling system in accounting for phonological processes in the language, yet the most concrete statement made about the dominant role of the orthography is this:

> Are the abstract lexical representations that are postulated by the linguist merely convenient fictions that the linguist manufactures for the purposes of grammar, or do they have a psychological reality for the language user? In other words, is the claim that the orthography corresponds to something real in the linguistic knowledge of the reader based on anything that the reader can be said to know? C. Chomsky (1970: 295)

This question suggests a strong intuition about the relationship of the orthography to the lexical representation. At this point it becomes relevant to ask why she appears to be 'splitting hairs' with the question. Her lack of commitment to an underlying orthographic system appears to be guided only by the need to be not too controversial, as one very careful statement reveals:

> It seems to me that in a very real sense the lexical level of representation and the corresponding aspects of English orthography do have a psychological reality for the language user. I realise that this assertion will be troublesome to many readers… C. Chomsky (1970: 295)

The possibility of a dominant position for the orthography, as a result, is never stated in any more concrete terms than this statement. A position is maintained where psychologically real abstract underlyers hold prime position, but '[to] which the orthography corresponds to quite closely' (1970: 296).

Despite the need to maintain the linguistic *status quo* C. Chomsky promotes a much stronger position for the possibility that orthography is a primary linguistic mechanism. Her discussion of how teaching of literacy can employ this strong similarity between the lexical representation and the orthography is well observed and presented - although the overall relevance of this aspect to the thesis is limited so only the conclusions are outlined here. She observes that 'words which *are* the same *look* the same' (1970: 294) which, although a restatement of the Morpheme Spelling Principle, is probably one of the most central aspects of language for literate speakers when they are trying to relate words. Also expounded is that from a spelling perspective the environment dictates the pronunciation:

> ...[the spelled] root alone does not really have a specific pronunciation until you know what ending goes with it. For example *nature-* and *histor-* are recognisable roots, but need to have endings before you can tell which pronunciation is intended'. C. Chomsky (1970: 298)

These ideas (the MSP and the necessity of all relevant morphological information) are probable explanations of how real people (not linguists) deal with language. Apart from linguistic scholars, who have found alternative and usually extremely complex alternatives, the written form of the language is far more real for the speaker, and the truth of the above statement is perhaps proven by the non-linguists redress to the spelling in cases of doubt regarding pronunciation. The orthography is the only linguistic aspect of the language that a literate speaker usually formally encounters. As such it (rightly or wrongly) attains a dominant position in their

perception and interpretation of language whether this admission is distasteful to the linguist or not.

The literate speaker is formally given a tangible physical representation of the language in the writing system. It does not defy reason, therefore, that this information is employed for construction of the phonological language mechanism, i.e. if a man is given a spade, he is unlikely to dig a hole with his bare hands. Likewise, it is not strange that the ready-made writing system, which the speaker learns, should be adapted for systematic storage and pronunciation. Zipf (1949) states that if a man has a tool which will allow him to do a task, then he will use the tool to do the task. This is coined *The Principle of Least Effort* and is a logical observation of a common human tendency. A system based on orthographic underlyers falls within the remit of this principle, as it is not only logical for a speaker, it is simple, easily accessible and stable for systematisation of the language. As each spelling is learned, along with any relevant pronunciation anomalies, e.g. silent letters and irregular stress patterns, the speaker extracts overall generalisations which are then used with newly encountered words. The system therefore crucially hinges on a conscious awareness of every lexical item, but this is not unusual when we consider the speaker's need to know a word's spelling to truly know it. This also explains why Spelling Pronunciation is so predictable when the speaker knows the spelled form but not the pronunciation.

C. Chomsky observes this systematic nature of the orthography, although she does not consider the possibility that the orthography and the lexical representation are one and the same thing. She cites the following poem, which I have reproduced here, to highlight the inconsistencies of the language. For the native fully literate speaker of the language though the similarity of the spelling does not obscure the pronunciations of the similarly spelled words. That we can read the words in the poem with the correct pronunciations suggests that the visual similarity of each word

is overridden by the fact that these spellings reflect morphemes and that they have a given pronunciation which this visual form triggers, i.e. the overall visual similarity of the forms is tempered by the speaker's awareness that the pronunciation associated with a given morpheme's spelling is finite. If we know the word, the Spelling Pronunciation which a given orthographic form will predict is blocked; otherwise, we produce the Spelling Pronunciation. At a single word level, therefore, there is regularity for the literate because they know how a given morpheme's spelling is pronounced. The point of C. Chomsky, therefore, is that regularity exists in English at a morphemic level and that this is directly reflected in the orthography.

Hints on Pronunciation for Foreigners.

I take it you already know
Of tough and bough and cough and dough?
Others may stumble but not you,
On hiccough[29], thorough, laugh and through.
Well done! And now you wish, perhaps,
To learn of less familiar traps?

Beware of heard, a dreadful word
That looks like beard and sounds like bird,
And dead: it's said like bed not bead-
For goodness' sake don't call it 'deed'!
Watch out for meat and great and threat
(they rhyme with suite and straight and debt.)

A moth is not a moth in mother
Nor both in bother, broth in brother,
And here is not a match for there
Nor dear and fear for bear and pear,
And then there's does and rose and lose-
Just look them up - and goose and choose,
And cork and work and card and ward,
And font and front and word and sword,
And do and go and thwart and cart-
Come, come, I've hardly made a start!
A dreadful language? Man alive.
I'd mastered it when I was five.

T.S.W.
(only initials of writer known)

[29] Note this now has a regularised spelling because /ʌp/ from <-ough> is not a synchronic correlation. Thus *hiccup*, where <-up> is transparent.

4.5 A Simple Orthographic Alternative to the Vowel Shift Rule.

The alternative to the VSR appears to be obvious: the orthography predicts all of the alternations in a simple, economical and predictable manner. This position also explains why the evolution of the VSR moved it to a state that only covers those alternations that are both orthographically as well as morphologically bound (even although this is not explicitly stated).

The first relevant aspect to the issue is why the vowels in the SPE VSR alternate with one another. In other words why does /aɪ/ alternate with /ɪ/? The vowels involved are remarkably tightly constrained. Why is it that we do not find /aɪ/ alternating with /ɒ/? From a phonological perspective we struggle to relate the vowels to one another because synchronically the relationship between the alternants is not easily definable - as SPE's abstractness and its return to historical forms clearly shows. There must be a simpler method of synchronically relating the alternations. Consider again the diagram from chapter 3 with the alarming correlations between the orthography and the phonology. If we take a given phonological alternation, such as /o/, /ɒ/ and /ə/, we discover that the one feature all three have in common is that they all correlate with <o>, which when constrained within the Morpheme Spelling Principle (MSP) gives the relationship the robustness and predictability we require. This is obviously far from coincidental as well as not being a particularly ground-breaking claim. What this shows though, is a ready-made governor in the MSP and the spelling-to-pronunciation norms.

Returning to the VSR, the alternations involved are all variant phonological representations of specific orthographic forms (except the [ʌ]~[aʊ] alternation which is not and as such is reflected in the spelling). Indeed, McMahon (1990: 202) states that 'we need only assume that speakers 'know' that certain patterns of alternation exist, involving certain pairs of vowels (so that, if [i] alternates, it will be with [ɛ],

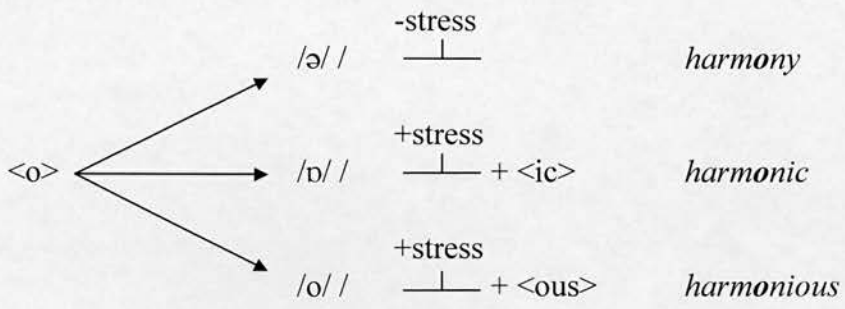
and likewise [ō] with [ɒ] and [aɪ] with [ɪ])'.[30] The likely source of this awareness is not explained, however the orthography is an obvious common denominator for the patterns of alternation. It is, therefore, likely that the speaker has used the orthography as the anchor for the relationship of the patterns McMahon requires. E.g. in the case of [ə], [ɒ] and [ō] as in *harmony-harmonic-harmonious* the common denominator is the graph <o>, which the literate speaker can easily and consciously observe as the common referent in the alternations. For *divine-divinity*, the <i> is the common factor and so on. If the orthography is considered to be the underlyer then none of the complex derivations outlined in the discussions of VSR above are required at all, and all of the alternations become bound and predictable through the MSP and standard rules. Also of benefit, perhaps, is that such a process does not involve manipulation of an underlying segment to a surface form, but instead involves selection of a surface form from the available phonological options associated with a given graph based on that graphs contextual requirements and stress (see 3.2.2). In other words there is no need to assume complex derivation of one vowel or consonant from another, but rather the underlyer is always the same and it is only the manifestation at a surface level that is different, as is dictated by the environment. Such a system of underlyers is therefore intuitive and economical as well as minimally abstract, albeit only for the literate speaker.

The underlyers proposed here are therefore different to the underlyers used in SPE, Halle (1977) and McMahon (1990) (even although McMahon's simplex forms are the same as their surface phonemic representation) as they are not representative of any vowel quality but are instead markers for the surface phonemic forms. This is best exemplified through examination of an orthographic underlyer and its possible

[30] A footnote attached to this statement observes that 'this statement represents an oversimplification, since [ī] and [ō] may also alternate with schwa (as a reduced form of [ɛ] or [ɒ]) in *comedian-comedy*, *harmonious-harmony*'. This confirms the basic principle that the relevant aspect is the grapheme and its variant surface phonological representations.

surface representations. Take for instance the graph <o> as it appears in words such as *harmony-harmonic-harmonious*. The relationship is as follows:

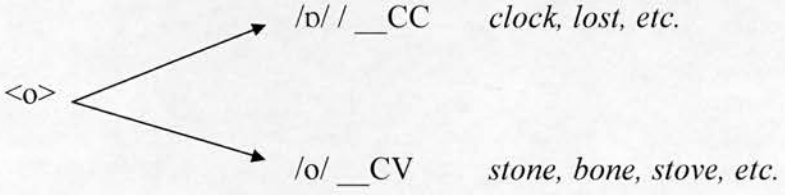
(29)



What we see here is that the underlying <o> is a schwa in *harmony*, an [ɒ] in *harmonic* and so on. The vowel quality does not change from one phoneme to another, the grapheme <o> is manifested as /ə/, /o/ or /ɒ/ depending on the morphological context in which the <o> appears. This is corroborated by the *petal-petallic* productivity outlined in Chapter 3, which cannot be assumed to have an arbitrary underlying full vowel as there is no alternation motivation for it. Yet the full vowel cannot be derived from the schwa without reference to the orthography, which is a far more cumbersome solution than one in which the orthographic form is manifested in a particular phonological way as is determined by the context.

But how do we know which rule to apply, as there appears to be more than one possible rule which can be applied? Consider the following:

(30)



Both (29) and (30) are representations of how the <o> grapheme will tend to be interpreted in specific contexts. So why is *harmonic* not /harmonɪk/ as rule (30) would predict? It appears that in general, rule (30) is applied to simplex forms, while

(29) is morphologically triggered. In fact, we find that the rules which Generative Phonology has developed are very good predictors of which rule will be applied. Obviously to state that rule (30) applies to simplex forms and rule (29) applies to complex forms is a little simplistic - even although it may be quite accurate. But if the concepts of CiV tensing and Trisyllabic laxing are salvaged from the annals of Generative Phonology we find that these environments, which are just as easily stated as orthographic environments as phonological ones, are a very accurate predictor of which vowel will be used, e.g.

(31)	*divinity*	TSS applies, so <i> will be /ɪ/
	harmonious	CiV applies, so <o> will /o/

There is of course the possibility that a speaker uses a far simpler mechanism to predict the vowels they require. When we examine processes such as the addition of certain morphemes we find predictable results. For example:

(32) Addition of the morpheme *-al*, *-ic* or *-ity*[31] will cause the stress to shift to the syllable preceding the affix, and the vowel will be the lax variant of the relevant graph, e.g. <atom>+<ic> /ˈatəm/-/əˈtɔmɪk/.

(33) Addition of the morpheme *-ian* will cause the stress to shift to the syllable preceding the affix, and the vowel will be the tense variant of the relevant graph, e.g. <Jonson>+<ian> /ˈdʒɔnsən/-/dzɔnsˈonɪən/.

On inspection it becomes apparent that all of the VSR alternations can be accounted for through statement of uncomplicated rules such as rules (31) to (33) and through utilisation of the general reaction tendencies of a given vowel in the environments rule (29) portrays. The Vowel Shift Rule becomes a morphologically driven process whereby a specific affix will cause stress in the preceding syllable and that the vowel, which is bound by its orthographic underlyer, will be either tense or lax as is defined by the affix. Using this approach, all of the complexity of the VSR is removed and a tangible, easily accessible process takes its place. Also those aspects of SPE's VSR

[31] The *obese~obesity* alternation does not follow the pattern and so will require marking.

which were most psychologically weak like the [aʊ]~[ʌ] alternation are now reflected in the spelling and so will be Spelling Pronunciations, as will those verbs with irregular past tense forms; with only the relevant spellings to be learned, each of which will be stored for specific syntactic requirements.

4.6 Morpheme Spelling, Morpheme Marking and Blocking.

The above covers why we do not have forms such as */harmonɪk/, but how do we know which of the representations of the vowel is to be used when there is no morphological context? In a system which is to employ a system of orthographic underlyers this crucial aspect requires some discussion and exemplification.

Consider *ton, con* and *scone* (SSE /skɔn/) and *some*. How can an orthographic system account for this inconsistency? The answer to this appears to come from two sources: firstly, from the MSP and the need to individually learn every morpheme's spelling; and secondly, from the knowledge of which pronunciation rule applies to a given graph in that specific morpheme. The MSP restricts the possible sounds available for a pronunciation through fixing a standard spelling to a word[32], e.g. **harminious* and **harmenic* are not allowed, and by the logical extension of this fact, any vowel phoneme which cannot be associated with the vowel in the spelling is removed as a possible pronunciation variant. However, this does not move us any closer to dealing with the problem of which association to make. Here the relevant factor is that the speaker must learn not only the spelling for every word, but they must correlate this with a pronunciation and even possibly the basic stress pattern of the word.[33] In marking the word in this way, the system can allow non-default

[32] Although obviously examples such as *Siobhan, Sean*, etc. stretch this restriction.

[33] How many people are in any way aware that *cadet* is stressed in an exceptional way? It is doubtful the speaker has any awareness of this anomaly at all, or of the fact that the word is originally from French which is why it has final stress. This again returns us to the possibility that all non-default stress patterns are learned, along with any morphological stress shifting patterns. But there is no way for the person to be guaranteed accuracy without externally checking the pronunciation/stress pattern.

pronunciations through blocking Spelling Pronunciations (which would be the only possible pronunciation within the system if non-Spelling Pronunciations were not marked as such, and if they did not have a blocking effect). Regarding the *ton* and *con* examples above there are the following possibilities:

(34) <o> → /ɒ/ __C[34]

(35) <o> → /ʌ/ __ C

There is no orthographic factor to determine which of these pronunciation possibilities should be used with either of the examples. One of the two is probably the default, and intuitively (and this decision is purely based on intuition) I would suggest it to be (34) based on it being the 'short' variant of the graph <o> and because it seems more like a Spelling Pronunciation. As such the underlying representation for the two examples can be stated as:

(36) <ton> RULE (35)
<con>

Where <con> is unmarked and is a Spelling Pronunciation, and <ton> has a pronunciation which blocks the application of the default pronunciation for this rhyme spelling.

As for examples such as *scone*[35] and *some*, both require marking as pronunciation based on the *dome* pattern would be the most likely Spelling Pronunciation, given that examples such as *some, come, Montgomery,*[36] etc. have to be learned as not containing /ɔ/ or /o/ which the speaker appears to default to. The default rule appears to be:

(37) <o> → /o/ /__CV

[34] Defining this as the default is done purely on intuitive grounds. A comprehensive and extensive study should be undertaken to establish the primary correlations for the literate speaker.
[35] Note *Scone Palace* will require the marking <o> → /u/ to block the production of /o:/, there is no other way to account for it.
[36] My name is /mənt'gʌmərɪ/ which is frequently pronounced as /mɔnt'gɔm(ə)rɪ/.

and the marking which is required to block (37) for *scone* and *some (Montgomery, come, etc.)* are:

(38) <o> → /ʌ/ / __CV

(39) <o> → /ɔ/ / __CV

giving underlying forms:

(40) <scone> rule (39)
<some> rule (30)

These words must be marked in this way, otherwise the more general rule (37) will not be blocked, predicting that the single vowel graph followed by a single consonant and a single vowel will have the tense variant of the vowel graph. Consider:

(41) <cone>
<bone>
<close>

Note, *close* also shows the <s> voicing rule that SPE converts for use with Generative Grammar. Observe how much more natural the <s> voicing is due to the existence of a final <e> which does not need to be created for the voicing to occur.

At an intuitive level this appears to be how the language is organised; and considering the literate speaker must be able to spell a word correctly as well as know the correct pronunciation, there must be a system in place such as this to account for the speaker's ability to produce distinct pronunciations even when faced with similar orthographic forms. What is debatable is which vowel quality is perceived by the speaker as the primary correlation, which one no doubt is; and which are non-standard, blocking the default.

Other problematic examples of partial and complete homography are *tear, close* and *wind.* Without clarification of which word class these examples belong to,

the best pronunciation anyone can give is to state all possible pronunciations. However when these are put into sentences there is no longer any ambiguity:

(42) Did you **tear** that picture?
Tears ran down her cheeks.
Close the door.
That was **close**.
Wind up that clock.
He had bad **wind**.

The syntactic and semantic context of these homographs ensures there is never a problem with the pronunciation when reading (and when we pronounce the relevant orthographic underlyer). When the string <tear> appears as a verb the relevant vowel quality is /e/ as opposed to /i/ if the string is a noun. In other words, although these two words share a spelling they never overlap due to syntactic category information and if that is not enough, obviously semantic information keeps them separate, so it is never an issue for the speaker. Likewise, with the string <close> the <s> voiced form is used in the verb, where the voiceless <s> is used in the adjective. There is obviously a problem where the overlap is at both a syntactic and orthographic level in examples such as:

(42) the tear ran down the paper.

This example is obviously a problem when reading, although the context of the sentence would be likely to clarify the issue. But no such problem exists for an underlying orthographic system since the correct pronunciation of the word would be automatic as the speaker would be trying to convey a given concept whether that be a rip in a piece of paper, or a bead of water which is running down a piece of paper; with the orthographic underlyer with the required semantics dictating the pronunciation. Overall there is never really overlap or confusion between homographs as a plethora of other factors confine the possibilities which are available as interpretations or pronunciations.

There is also the issue of silent letters. Again there would seem to be the simple need to mark those letters which were to appear in the orthography and which would not have a phonological correlation. Some such as the <k> in *knight, know* a and *Knorr* are constrained phonotactically in that the phonology does not allow initial /kn-/ clusters. The same is true of the initial <p> in *pneumonia, pneumatic*, etc. These requirements though can easily be written into the grammar so these words maintain the spelling while limiting the pronunciation possibilities. Ehri (1984) shows that words with silent letters are harder to commit to memory, yet once learned they have a greater prominence in the memory for the speaker. What this greater difficulty encountered in memorising these letters perhaps reflects is the speaker's need to override the norm of trying to pronounce the underlying forms, and the awareness by the speaker of the non-standard nature of the silent letter. Overall, there is nothing particularly difficult for the theory of orthographic primacy regarding silent letters as they are merely marked like any other aspect that does not follow the standard norms.

4.7 Spelling Pronunciation - a final definition.

The issue of Spelling Pronunciation has plagued linguistic study for at least a century and a half, as references to relevant studies throughout this thesis show. The mechanics of the phenomenon have always been understood as can be seen from this description from Luick (1903):

> Not only have the typical pronunciations of the letters become further removed - in some instances substantially - from those which are frequently valid in other Germanic and Romance languages, but there are also many words which constitute exceptions to these specifically English pronunciations. If such words are rare in spoken language, i.e. they are predominantly read and written but rarely heard or spoken, then the written image does not trigger the sound image which is fixed in the memory, but instead is transformed into one by analogy, using the next best thing which is to assign the normal, typical pronunciations to the letters, with the result that

> the pronunciations can sometimes be considerably removed from the originals.

The definition is one which would be considered accurate for the process of Spelling Pronunciation. The problem is justifying why it occurs with such frequency, and perhaps more relevantly why it occurs at all (without acknowledging a role for the orthography in the system). We know what is happening, but why is it happening? The answer to this, I believe, lies in the previous discussions undertaken in this thesis: an underlying orthographic system which works on defaults and norms. Only through this type of system can the motivation for Spelling Pronunciation be found, and any justification for its widespread occurrence.

I would suggest the following definition of Spelling Pronunciation, to complement Luick's description of the mechanics:

> **A Spelling Pronunciation is the default pronunciation of a lexical representation which is unmarked in terms of spelling-to-pronunciation rules and stress rules.**

In other words, Spelling Pronunciation is what the system will ideally produce. Anything which is not a Spelling Pronunciation will be marked, blocking the Spelling Pronunciation - but will always be likely in the end to be superseded by that which it blocks.

There is a misconception that a Spelling Pronunciation is in some way a reflection of the spelled form in its most basic way, but in fact, Spelling Pronunciation can be seen as the whole synchronic system working in its most basic way. We can see this from our pronunciations of made-up words such as *zight* and *knopple*. The system works in a structured and constrained manner that, to the literate, is second nature. The orthography is, therefore, in today's literate society, a central linguistic entity. Man-made or not, it has achieved a core position for the simple reason that it works and is tangible and meets the necessary requirements to

relate morphological forms which have degraded diachronically. Who are we as linguists to argue?

4.8 Conclusion.

The beginning of this chapter examined the influence of orthography on the most dominant phonological theory in recent times (although it is no longer the state-of-the-art theory it was in its heyday). The evidence is inescapable, with the devices employed in SPE obviously reworked spelling-to-pronunciation rules. The Vowel Shift Rule is shown to be an over-complex rule which is far simpler and intuitive when observed as part of the standard processes of spelling-to-pronunciation norms. Overall, the shadow that the orthography casts over Generative Phonology, in terms of both its greater simplicity and its role as source for many of the GP devices, is quite startling. It appears that not only does orthography pervade the language, but it also pervades the theories required to account for the language. Although the reasons for this should now be obvious: if a language is based on the orthographic system, then the theory that accounts for it will follow the same pattern.

There are many things that this study was not able to answer, and various areas that require further study. The first of these is the anomaly of Spelling Pronunciation becoming the standard in a populace with limited literacy levels. This problem has bothered me throughout the thesis, and I have no answer to the riddle. It seems obvious that such a process should occur in a literate society, however, the phenomenon is difficult to account for in a less literate society.

I have found the following issues arising from this thesis as worthy of further study: (1) it would be useful to empirically ascertain the absolute defaults for spelling-to-sound correspondences and the relative order of secondary defaults. This would allow the system to be further streamlined and would increase the accuracy, removing some of the more unpalatable marking. (2) the theory would also benefit

from a thorough analysis of stress as it is applied to orthographic forms when reading, to ascertain the regularities which are employed in the process. It is possible the stress system is not quite as simplistic as the system employed here, however, an entire thesis could be directed towards this issue without finding all the solutions.

At the very beginning of this thesis there is a quotation from a book by Joe Tasker, a great mountaineer who sadly died in a summit attempt with Peter Boardman on Mount Everest in 1982. Before his death he achieved some of the most difficult climbs in the Alps and the Himalayas, the quote describing their first thoughts before a successful ascent of Changabang in the Himalayas. The quote is included as it implicitly states something that I feel to be quite important: we can look for problems, and decide on the basis of those problems that what is suggested is impossible. Or we can work out the solutions.

Joe Tasker climbed mountains.

Bibliography.

Aitchison, J. (1995) *The Articulate Mammal - An Introduction to Psycholinguistics,* 3rd Edition. London: Routledge.

Anderson, S.R. (1981). 'Why phonology isn't natural'. *Linguistic Inquiry,* 32.

Archangeli, D. & D.T. Langendoen (eds.) (1997). *Optimality Theory: An Overview.* Oxford: Blackwell.

Bloomfield L. (1933) *Language.* New York: Henry Holt and Company.

Bolinger, D. (1975). *Aspects of Language.* 2nd Edition. New York: Harcourt.
(1981) *Two kinds of vowels. Two kinds of rhythm.* Bloomington: Indiana University Linguistics Club.

Brown, R. & McNeill, D. (1966) 'The "Tip of the Tongue" Phenomenon'. *Journal of Verbal Learning and Verbal Behaviour,* 5: 325-337.

Bruce, D. J. (1964) 'The analysis of word sounds'. *British Journal Educational Psychology, 34*: 158-170.

Bryant, P. (1996) 'Phonological and Grammatical Skills in Learning to Read' In de Gelder, B. and J Morais (eds.) *Speech and Reading: A Comparative Approach* : 249-266. United Kingdom: Erlbaum, Taylor and Francis.

Calfee, R.C., Chapman, R.S. and Venezky, R.L. (1972) 'How a child needs to learn to read'. In W.L. Gregg (Ed.), *Cognition in learning and memory*: 139-182. New York: Wiley

Carney, E. (1994). *A Survey of English Spelling.* Routledge: London.
(1998) 'English Spelling is Kattastroffik'. In L. Bauer and P. Trudgill (eds.) *Language Myths:* 32-40. Penguin: London.

Chomsky, C. (1970) 'Reading, Writing, and Phonology', *Harvard Educational Review*, Volume 40, No. 2: 287-309.

Chomsky, N. & Halle, M. (1991) *The Sound Pattern of English,* 2nd paperback edition [1st Edition 1968]. Cambridge MA: MIT Press.

Chomsky, N. (1970) 'Phonology and Reading'. In H. Levin and J. P. Williams (eds) *Basic Studies in Reading*: 3-18. London: Basic Books, Inc.

Derwing, B. (1973) *Transformational Grammar as a theory of language acquisition.* Cambridge MA: MIT Press.

Dobson, E.J. (1968) *English Pronunciation 1500-1700*, Volume II. Oxford: Clarendon Press.

Doctor, E., and Coltheart, M. (1980) 'Phonological recoding in children's reading for meaning'. *Memory and Cognition*, 80: 195-209.

Ehri, L.C. (1984) 'How orthography alters spoken language competencies in children learning to read and spell'. In J. Downing & R. Valtin (eds.), *Language Awareness and Learning to Read*: 119-147. New York: Springer-Verlag.

(1986) 'Sources of Difficulty in Learning to Spell and Read'. *Advances in Developmental and Behavioural Paediatrics*, Volume 7: 121-195.

Firth, I. (1972) *Components of Reading Disability*. Unpublished Ph.D. thesis. University of New South Wales.

Fowler, W. (1962) 'Teaching a two-year-old to read: an experiment in early childhood learning. *Genetic Psychology Monographs*, 66: 181-283.

Fox, B., and Routh D.K. (1975) 'Analysing spoken language into words, syllables, and phonemes: a developmental study'. *Journal of Psycholinguistic Research*, 4: 331-342).

Fudge, E.C. (1969) 'Syllables'. *Journal of Linguistics*, 5: 253-286.

Giegerich, H.J. (1992a) 'The Limits of Phonological Derivation: Spelling Pronunciations and Schwa in English'. *Linguistische Berichte*, 142: 413-436.

(1992b) *English Phonology: An Introduction*. Cambridge: Cambridge University Press.

Griffen, T. D. (1985) *Aspects of Dynamic Phonology*. Amsterdam/Philadelphia: John Benjamins Publishing Company.

Görlach, M. (1993) *Introduction to Early Modern English*. Cambridge: University Press.

Halle, M. (1977) 'Tenseness, vowel shift and the phonology of back vowels in Modern English'. *Linguistic Inquiry*, 8: 611-625.

Halle, M. & K.P. Mohanan (1985). Segmental Phonology of modern English. *Linguistic Inquiry,* 16: 57-116.

Halliday, M.A.K. (1985) *Spoken and Written Language*. Victoria: Deakin University Press.

Hancock, G. & Faiia, S. (1998) *Heaven's Mirror: Quest for the Lost Civilisation*. London: Michael Joseph Ltd.

Hardy, M., Stennett, R.G. and Smythe, P.C. (1973) 'Auditory segmentation and auditory blending in relation to beginning reading'. *Alberta Journal of Educational Research*, 19: 144-158.

Harris, M. and Coltheart M. (1986) *Language Processing in Children and Adults: An Introduction.* London: Routledge and Kegan Paul Plc.

Householder, F. W. (1971) *Linguistic Speculations*. London: Alden and Mowbray Ltd.

Hudson, R. (1984) *Word Grammar*. Oxford: B. Blackwell.

Hyman, L.M. (1975) *Phonology Theory and Analysis*. New York: Holt, Rinehart and Winston.

Jaeger, J.J. (1980) *Categorization in Phonology: An Experimental Approach*. PhD dissertation. University of California, Berkely.

(1984) 'Assessing the psychological status of the Vowel Shift Rule'. *Journal of Psychiatric Research*, 13: 13-36.

(1986). 'On the acquisition of abstract representations for English Vowels'. *Phonology Yearbook* 3: 71-98.

James, W. (1893) *The Principles of Psychology*, Volume 1. New York: Holt.

Jones, C. (1989) *A History of English Phonology*. London: Longman.

Kerek, A. (1976) 'The Phonological Relevance of Spelling Pronunciation'. *Visible Language*, X4 Autumn: 323-338.

Kiparsky, P (1985) 'Some consequences of lexical phonology'. *Phonology Yearbook*, 2: 85-138.

Kiparsky, P. & Menn, L (1977) 'On the acquisition of phonology'. In Macnamara, J. (ed.) *Language Learning and Thought*: 47-78. New York: Academic Press.

Kolers, P.A. (1970) 'Three Stages of Reading'. In Levin, H. & J.P. Williams (eds) *Basic Studies in Reading*: 90-118. London: Basic Books Inc.

Kucera, H. and Francis, W.N. (1967) *Computational Analysis of Present-Day American English*. Providence: Brown University Press.

Labov, W. (1972) *Sociolinguistic Patterns*. Philadelphia: University of Pennsylvania Press.

Ladefoged, P. (1972) 'Phonetic prerequisites for a distinctive feature theory'. In A Valdmen (ed.) *Papers in Linguistics and Phonetics to the memory of Pierre Delattre*: 273-285. The Hague: Mouton.

Lambert, J.J. (1972) *A Short Introduction to English Usage*. New York: McGraw-Hill.

Lenel, J. and Cantor, J. (1981) 'Rhyme recognition and phonemic perception in young children'. *Journal of Psycholinguistic Research*, 10: 57-67.

Liberman, I. Y. Shankweiler, D., Fischer, F. W., & Carter, B. (1974) 'Explicit syllable and phoneme segmentation in the young child'. *Journal of Experimental Child Psychology*, 18: 201-212.

Lima, S. D. and Pollatsek, A. (1983) 'Lexical Access via an Orthographic Code? The Basic Orthographic Syllabic Structure (BOSS) Reconsidered.' *Journal of Verbal Learning and Verbal Behaviour*, 22: 310-332.

Linell, P. (1979) *Psychological Reality in Phonology: A Theoretical Study.* Cambridge: University Press

Lodge, K (1984) *Studies in the Phonology of Colloquial English.* London: Croom Helm

Luick, K (1903) 'Review of Koepell (1901)'. *Beiblatt zur Anglia*, 14: 304-307.

McCully C.B. (forthcoming) 'Left-hand word-stress in the history of English'. In Fikkert P. & H. Jacobs *Developments in Prosodic Systems*. Berlin and New York: Mouton de Gruyter

McMahon, A.M.S. (2000): *Change, Chance and Optimality*. Oxford: OUP.
(1990). 'Vowel shift, free rides and strict cyclicity'. *Lingua* 80: 197-225.

MacLean, M., Bryant, P., and Bradley, L. (1987) 'Rhymes, nursery rhymes, and reading in early childhood'. *Merrill-Palmer Quarterly*, 33: 255-281.

Mann, V.A. (1986) 'Phonological Awareness: the role of reading experience.' *Cognition*, 24: 65-92.

Mohanan, K.P. (1986) *The Theory of Lexical Phonology*. Dordrecht: Reidel.

Morais, J., Bertelson, P., Cary, L., & Alegria, J. (1979) 'Does awareness of speech as a sequence of phones arise spontaneously?' *Cognition*, 7: 323-331.

Nathan, G.S. (1979) 'Towards a Literate Level of Language' in P.Clyne *et al.* (eds) *The Elements: A Parasession on Linguistic Units and Levels*: 144-151. Chicago: Chicago University Press.

Prince, A. and P. Smolensky (1993). *Optimality Theory: Constraint Interaction in Generative Grammar*. MS, Rutgers University Centre for Cognitive Science.

Saussure, F. De (1906-15) *Course in General Linguistics*. Translated and Annotated by Roy Harris, (1983). Bally, C & A. Sechaye (eds.). London: Duckworth & Co. Ltd.

Seidenberg, M.S. and Tanenhaus, M.K. (1979) 'Orthographic effects in rhyme monitoring'. *Journal of Experimental Psychology: Human Learning and Memory*, 5: 546-554.

Selkirk, E.O. (1982) 'The syllable.' In H. van der Hulst & N. Smith (eds.), *The Structure of Phonological Representations, Part II*: 337-383. Dortrecht, Holland: Foris.

Seymour, P.H.K., and Elder, L. (1985) 'Beginning reading without phonology'. *Cognitive NeuroPsychology,* Volume 3: l-36.

Shattuck-Hufnagel, S. (1983). 'Sublexical units and suprasegmental structure in speech production planning'. In P. MacNeilage, Ed., *The Production of Speech,* New York: Springer: 109-136.

Stanovich, K.E., Cunningham, A.E., and Cramer, B. (1984) 'Assessing phonological awareness in kindergarten children: Issues of task comparability'. *Journal of Experimental Child Psychology*, 38: 175-190.

Steinberg, D.D & Krohn, R.K. (1975) 'The psychological Validity of Chomsky and Halle's Vowel Shift Rule'. In E.F.K. Koerner (ed.) *The Transformational-Generative Paradigm and Modern Linguistic Theory*: 233-259. Amsterdam: John Benjamins.

Sweet, H. (1888) *A History of English Sounds*. Oxford: Henry Frowde.

Taft, M. & Hambly, G. (1985) 'The Influence of Orthography on Phonological Representations in the Lexicon'. *Journal of Memory and Language.* 24: 320-335.

Taft, M. (1979) 'Lexical Access via an Orthographic Code: The Basic Orthographic Syllabic Structure (BOSS)'. *Journal of Verbal Learning and Verbal Behaviour*, 18: 21-39.

Tanenhaus, M.K., Flanigan, H.P. and Seidenberg, M.S. (1980) 'Orthographic and phonological activation in auditory and visual word recognition'. *Memory & Cognition*, 8: 513-520.

Templeton, S. (1979) 'Spelling first, sound later: the relationship between orthography and higher order phonological knowledge in older students'. *Research in the Teaching of English,* 13: 255-264.

Treiman, R. (1984) 'On the status of final consonant clusters in English syllables'. *Journal of Verbal Learning and Verbal Behaviour*, 26: 608-631.

(1985) 'Onsets and rimes as units of spoken syllables: Evidence from children'. *Journal of Experimental child Psychology*, 39: 161-181.

(1992) 'The Role of Intrasyllabic Units in Learning to Read and Spell'. In Gough, P. B. and L. C. Ehri and R. Treiman (eds.) *Reading Acquisition*: 65-106. London: Lawrence Erlbaum Associates.

Treiman, R. and Baron, J. (1981) 'Segmental analysis ability: Development and relation to reading ability'. In G.E. MacKinnon and T.G. Waller (Eds.), *Reading Research: Advances in Theory and Practice*, Volume 3: 159-198. San Diego, CA: Academic Press.

Treiman, R. & Zukowski, A. (1991). 'Levels of phonological awareness'. In S. Brady & D. Shankweiler (Eds.), *Phonological Processes in Literacy: A Tribute to Isabelle Y. Liberman*. Hillsdale, NJ: Erlbaum

Venezky, R. (1970) *The Structure of English Orthography* (Janua Linguarum: Series Minor; 82). The Hague: Mouton.

Wang, H.S. (1985) *On the Productivity of Vowel Shift Alternations in English: An Experimental Study*. PhD dissertation, University of Alberta.

Wells, J.C. (1990) *Pronunciation Dictionary*. Essex: Longman.

Wiese, R. (1996) *The Phonology of German*. London: Clarendon Press.

Wijk, A. (1966) *Rules of Pronunciation for the English Language*. New York: Oxford University Press.

Yopp, H.K. (1988) 'The validity and reliability of phonemic awareness tests'. *Reading Research Quarterly*, 23: 159-177.

Zipf, G. K. (1949) *Human Behaviour and The Principle of Least Effort. An Introduction to Human Ecology.* Cambridge MA: Addison-Wesley Press, Inc..